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THE

SURGEON'S PRACTICAL GUIDE.

LONDON :
PRINTED BY SAMUEL BENTLEY,
Dorset-street, Fleet-street.

THE

SURGEON'S PRACTICAL GUIDE

IN

DRESSING,

AND IN THE METHODIC

APPLICATION OF BANDAGES.

By THOMAS CUTLER, M.D.

LECTURER IN THE BLENHEIM-STREET SCHOOL OF MEDICINE;
FORMERLY STAFF-SURGEON IN THE BELGIAN ARMY.

ILLUSTRATED BY NUMEROUS ENGRAVINGS.

SECOND EDITION,

ENLARGED AND REVISED.

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5-8.

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TO

SAMUEL COOPER, Esq.

MEMBER OF THE COUNCIL OF THE ROYAL COLLEGE OF SURGEONS,

PROFESSOR OF SURGERY IN THE UNIVERSITY OF LONDON, &c. &c.

WHOSE

LABORIOUS EXERTIONS IN THE FIELD OF PRACTICAL SURGERY

HAVE GAINED HIM

A CELEBRITY

AS UNIVERSAL AS EXALTED,

AND WHOSE KIND DEPORTMENT,

AND ZEALOUS INTEREST IN THE ADVANCEMENT AND WELFARE OF

HIS PUPILS,

HAVE ENDEARED HIM TO AN EXTENSIVE CLASS,

THIS

SMALL TREATISE ON A PRACTICAL POINT OF SURGERY

IS

RESPECTFULLY INSCRIBED

BY

A FORMER PUPIL OF THE UNIVERSITY.

PREFACE

TO

THE SECOND EDITION.

THE favourable reception accorded to the former edition, affords the Author a gratifying proof that his views were correct, and his anticipations not ill-founded.

In the present edition, by effecting numerous improvements, — particularly in the introduction of Mayor's new system of Bandaging and Suspension,—he has, he trusts, not only materially increased the usefulness of the work, but furnished it with a still greater claim to the kind attention of his professional brethren.

63, *Margaret-street, Cavendish-square,*
November 1836.

PREFACE.

A Pocket Manual, calculated to improve a department of Surgery which, unfortunately, has been too long neglected in this country, and spare the practitioner the sacrifice of much valuable time, cannot but be deemed a great desideratum. How far the Author may be likely to succeed in accomplishing these important objects, will be seen in the perusal of the following pages.

The work is divided into two parts: the first treating of Dressings and Bandages in general, and the principles of their application; the second, of Bandages in particular, classed according to the regions of the body, under the respective heads of Bandages of the Head and Neck, of the Trunk, of the Upper, and of the Lower Extremities. Each Bandage is moreover subdivided into its Composition, its Application, and its Use; particular observations being added as occasion may have required.

Throughout the whole work, which is illustrated in various parts by wood-cuts carefully executed by Messrs. Bagg and Son, the Author has endeavoured to render the details as brief as possible, without the sacrifice of either clearness or exactitude. He has drawn the materials necessary to its execution from practice, from personal observation in the British and Continental Hospitals, and from the works of the most distinguished writers upon Surgery generally, or upon this department in particular of the science; introducing nothing but what has appeared to him decidedly useful, he has still allowed for cases of great consequence an ample choice of means.

To conclude, he has studied to render the Work equally valuable to the Army and Navy Surgeon, the general Practitioner, and Student. His whole and sole aim has been utility, and should the event prove that he has not been mistaken in his views, the conviction of having done some service in the field of British Surgery, will adequately repay him for his pains.

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THE

SURGEON'S PRACTICAL GUIDE.

PART THE FIRST.

UPON DRESSINGS AND BANDAGES IN GENERAL, AND THE PRINCIPLES OF THEIR APPLICATION.

DRESSING may be defined to be the application, upon operated or diseased parts, of certain apparatus, designed for facilitating the reunion of solutions of continuity, for protecting them likewise from the contact of exterior bodies, and from the injurious influence of deleterious emanations, for bearing such remedies as are calculated to place them in the most favourable condition for the accomplishment of their cure, and, in fine, for preventing the neighbouring parts from becoming foul, through the exudation of purulent discharge, &c.

The objects which constitute these apparatus, are lint, charpie, compresses, rollers, adhesive plaster, setons, protective bandelettes, cushions, splints, pallettes, soles or foot-boards, and the fracture box and bridge.

Lint is a tissue so well known, that it needs no description here.

Charpie is a name given by the French to a collection of filaments separated from morsels of old linen rag four or five inches square, and of loose texture, which they use in lieu of lint, and to which they give a decided preference; it may be used in all cases where the employment of lint is indicated, and will be found to absorb much better. It is divided into two kinds, the *charpie brute* and the *charpie râpée.* The *brute* is either fine or coarse according to the linen employed in its fabrication; the first sort is placed in immediate contact with the surfaces of wounds, on account of its softness and absorbing qualities; the second is employed as an upper stratum for reasons of economy. The *râpée* is made by scraping fine linen rag or long charpie with the back of a knife: it appears to be more irritating than the first kind, and absorbs the pus with greater promptitude. According to the manner in which the French arrange the fibres of the first kind of charpie, it takes the name of plumasseau, bourdonnet, tente, mèche, tampon, or pelote.

The *Plumasseau* is a mass of charpie, the filaments of which are laid parallel to each other, the ends being folded under and flattened between the palms of the hands. Plumasseaux take different sizes and forms to adapt themselves to the parts upon which they are to be applied. They should neither be so thick as to surcharge the part, nor so thin as to become too quickly penetrated by the pus; neither should they be insufficient to maintain a proper quantity of medicamentous matter.

The *Bourdonnet* is a little mass of charpie, rolled into an oblong form between the hands. It is usually tied in the middle: it serves for absorbing the pus in a deep wound, and preventing a premature union of the edges of the division.

The *Tente* differs only in size from the bourdonnet; it is, however, usually rolled tighter. It is employed in diseases of the anus, and in those cases generally in which it is required to dilate an opening or canal. The bourdonnet is sometimes made of prepared sponge or of gentian root.

The *Mèche* is an assemblage of filaments of char-

pie ranged parallel to each other, and doubled at the centre: it is introduced into fistulous openings, &c. upon the point of the probe, and effects their obliteration gradually from below upwards.

The *Tampon* is a mass of charpie varying in size, rolled between the hands into the shape of a ball: it serves for cleansing ulcerated surfaces and for stopping hemorrhage. For the latter indication the tampon is frequently made of the boletus igniarius, or puff ball.

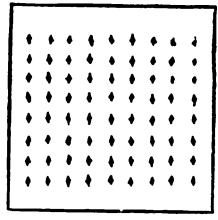
The *Pelote* is a large tampon surrounded by a morsel of soft rag, the edges of the latter being brought together and firmly tied: it is occasionally made use of in the treatment of hernia, and in the compression of large vessels, in operations, accidents, &c.

Compresses are pieces of linen used for confining dressings of charpie or lint in their proper situation, preserving wounds from the action of the air, equalizing the surface of members, compressing the soft parts, &c. The linen made use of should be moderately fine, and free from darns or hems. Compresses are folded or otherwise arranged, in

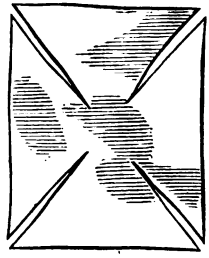
various manners, to fulfil these several indications. They are either square or oblong: of the first variety are

The *Common Square Compress*, cut or rent sometimes of an oblong form, and then doubled so as to form a perfect square.

The *Cribriform Compress* (syn. Compresse Fenêtrée, Fr.), a square piece of fine linen rag pierced with a considerable number of small holes; when applied, its under surface is smeared with a little of any simple ointment. It is employed to cover a large suppurating surface, and allow of the easier displacement of dressings which would become otherwise adherent.

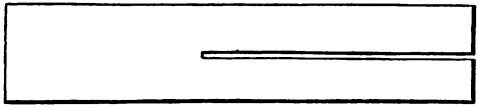


The *Maltese Cross*, formed from the common square compress by splitting it to a certain distance from the angles toward the centre; it is applied over the stump of a member after amputation, in order to confine the dressings. Of the second variety are



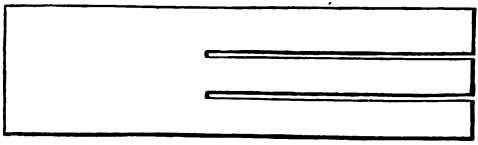
The *Common Oblong Compress*, which is usually four times as long as it is wide; it serves to surround the trunk, or a member, for a variety of purposes.

The *Single Split Compress;* an oblong piece of linen split in the manner represented in the



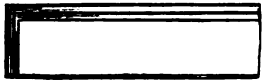
cut; it is applied over the stump of a limb in the process of amputation of the arm or thigh, the tails passing one on each side of the bone to protect the soft parts from the teeth of the saw.

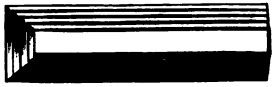
The *Double Split Compress* differs only from the preceding in being split into three heads; it is employed with the same intention in amputations of the fore-arm and leg.



The *Common Graduated Compress;* a piece of linen folded several times upon itself; these folds

ought to cover each other entirely: the manner of its construction will be seen in the description of the





Graduated Pyramidal Compress; to form this compress the surgeon takes a strip of linen about a foot long, and of a breadth proportionate to the extent of the parts to be submitted to its action; he begins by folding it backwards and forwards from one end to the other, each fold diminishing in breadth until the last bears a resemblance to the summit of a pyramid.

The two last are compressive and expellent.

Rollers are of linen, calico, or flannel; those of linen and calico are indifferently employed in all ordinary cases in which a roller is indicated; in some cases, however, flannel rollers are to be preferred; they afford greater warmth; they possess the quality of absorbing moisture freely; and their elasticity renders them peculiarly adapted to the treatment of rheumatismal and œdematous swellings, and even to fractures and dislocations, when they are followed by much tumefaction. There is an excellent elastic cotton roller made by Churton, No. 90, Oxford-street, possessing considerable lightness, which in many instances would advanta-

geously replace the flannel roller. They are long bands rolled up into one or two heads; hence the terms, single and double-headed roller. The parts of a single-headed roller are, the *head*, of *cylindrical* form, the *initial* end, or free extremity, and *the end*, properly so called, which remains concealed in the cylinder, and eventually terminates the bandage: the parts of a double-headed roller are, the heads (containing the ends), and the centre, called by the French the *plein*. No particular directions need be given for the rolling of a band, although it is of great importance that it should be done with care; when it is not sufficiently tight, it is unsteady in the surgeon's hands, often slips through the fingers, and is difficult to apply; on the contrary, when it is rolled firmly, it can be applied with the utmost promptitude and precision.

Adhesive Plasters are plastic substances spread on calico, linen, or silk; they are cut into a great variety of forms and sizes, and are used for uniting divided parts, and sometimes for confining certain portions of dressings. The quality of the adhesive substance differs, according to the therapeutic indications which the plaster is intended to fulfil: the following is the formula for the preparation of the

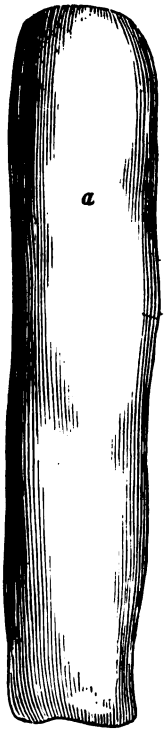
plaster employed by Mr. Baynton in the treatment of chronic ulcers of the legs (See Part II. Sect. 4. Compressive Bandage of the leg). Litharge plaster or diachylon is to be slowly melted in an iron ladle with a small quantity of resin, in the proportion of half a drachm of the latter to an ounce of the former; it should be stirred till it begins to cool, and then extended thinly over slips of smooth porous calico, of a convenient length and breadth, by sweeping it quickly from the end held by the left hand of the person who spreads it, to the other held by another person, with the common elastic spatula of apothecaries.

Plasters are occasionally applied to soften indolent tumours, to procure their resolution, or accelerate their suppuration; in these cases the angles of the plasters should be divided, in order that they may be made to fix more accurately upon the part.

The *Seton* is a narrow strip of soft linen rag, a few of the longitudinal fibres of which are drawn out from each side, leaving a rough or jagged border, or a skein of silk or thread, or better still, as it is much more cleanly, a slip of elastic gum about four inches long; it is used for exciting inflammation and suppuration, by

being pushed through a fold of the skin, in a needle made for the purpose.

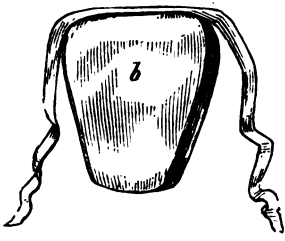
The *Protective Bandelette* (syn. Bandelette decoupée, Fr.) is a very narrow strip of fine linen rag



smeared over with simple ointment, and snipped along one border with a pair of scissors in the way represented in the wood-cut. The use of this is to surround a wound or ulcer, in order to protect its edges from the dressings which cover it, and which by their adherence would frequently disturb the process of cicatrization.

Cushions are sacks of various forms, filled with oat-chaff or any other appropriate material; those employed in fractures are filled about three-quarters full, and should be a little longer and wider than the splints; they are made use of also to support the

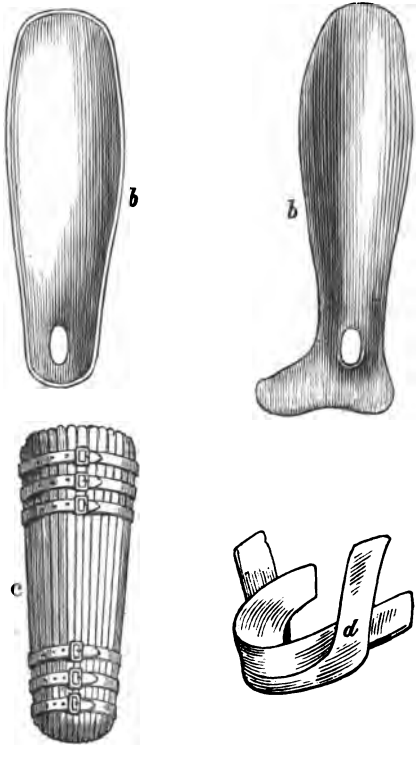
extremities in cases of wounds and fractures, and are to be met with in the shops, for this purpose,



made of an impervious tissue distended with air; *a*, cushion for splints in fractures of the lower extremities; *b*, Dessault's cushion, employed in fractures of the clavicle, &c.

Splints are thin pieces of wood or pasteboard, of various forms, used in the treatment of fractures and luxations, for maintaining the reduced parts in their natural position; also in the dressing of those wounds in which the cicatrization tends to alter the natural direction of the parts. They are sometimes of a complicated construction, as those employed in fractures of the neck of

the thigh-bone, &c.; the ones represented by the wood-cuts are, *a*, a modification of the long splint (Dessault's) employed in fractures of the thigh;



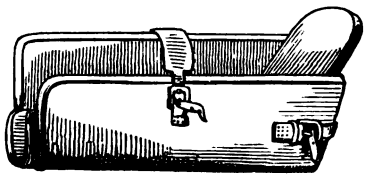
bb, (Cline's splints) they are wooden splints hollowed in such a manner as to be able to accommodate themselves to the form of the leg, with holes

to receive the malleoli; *c*, a splint made of a very thin piece of wood, to the inside of which is glued a piece of soft leather of the same size; the wood is afterwards split into several strips, it is thus rendered capable of adapting itself with tolerable accuracy to the arm, where it is most usually applied; *d*, a pasteboard splint for fracture of the lower jaw-bone; see the various kinds of apparatus for fractures in the second part of the work.

Pallettes.—A pallette, or hand splint, is a thin flat piece of any light wood shaped out to the form of the hand and fingers, which it is employed to sustain in injuries of these parts.

Soles are similar pieces of wood cut in the form of the sole of a shoe; they are pierced at the sides with two holes called mortises: their use is to sustain the foot, and prevent its extension and change of position in fractures of the lower extremities: they may in general be replaced by a band, the centre of which is to be applied to the sole of the foot, one circular turn being effected with it round the foot; the extremities are then crossed at the bend of the instep, and afterwards secured one on each side to some part of the lower portion of the apparatus. Soles form a part of certain compound apparatus, and are sometimes made of iron.

Hospital Fracture Box.—The sides and footboard move upon hinges, which connect them with its floor: the entire of its inner surface is lined



with flat cushions, and the footboard padded; over these a sheet of oil-skin is thrown to protect them from the moisture of the applications; the leg is gently deposited on the middle cushion, and the sides of the box raised and kept fast by a cross strap and buckle; a band is then applied round the ankle and instep, and the ends are brought through the fissures of the footboard and tied. By this means a moderate extension may be kept up; a further extension can be easily made by drawing the whole box downwards a little, and tightening the cross strap, its weight alone being sufficient to maintain it in its proper situation. When it is required to give the limb a semiflexed position, a pillow should be introduced beneath the upper end of the box, where the ham rests.

This is a convenient machine, and may be readily constructed: it admits of applications being made immediately upon the limb without disconcerting it, from the upper surface of the limb lying exposed.

Fracture Bridge.—Two pieces of wood an inch and a-half square, and from twenty to twenty-four inches in length, are each perforated on one of their

faces to a certain depth with four holes, into which are introduced the ends of four slender iron rods bent over to connect them; these last are bound together by a bit of wire which runs along the upper part. It serves to protect the injured limb from the pressure of the bed-clothes. Broad thin strips of wood may be conveniently substituted for the iron rods.

These are the ordinary materials used in dressing; but, as they cannot upon all occasions be obtained, means more simple must be substituted for them; and the more readily such means can be procured, the greater also their simplicity and uniformity, the less embarrassing will it be for the surgeon to fulfil his duties, the less perilous will be the progress of the treatment, the less doubtful the chances of its termination.

The above observations are intended to apply more particularly to the circumstances in which surgeons may be placed in wild and thinly peopled districts, as in colonies; also in campaign, when the stores are greatly diminishing, or altogether fail, as is not unfrequently the case: and how vexatious, how painfully embarrassing, such deficiencies are found to be, can scarcely be conceived by those who have not had to struggle with the difficulties consequent thereon!

The individual who has the most successfully reflected upon this subject, who has the most la-

boured, in short, at the simplification of surgical apparatus, in order that under any—even the least favourable—circumstances, relief may be afforded, and a plan of cure employed, as safe and as commodious as in the best appointed hospitals, is M. Matthias Mayor, chief surgeon of the hospitals of Lausanne.

The principle he has laid down, is, to use his own words, "*Reduire, autant que possible, tous les appareils à leur plus simple expression, en les rattachant à un principe unique et uniforme; et faire en sorte que les pièces de ces appareils, ou les objets matériels d'un pansement quelconque, soient si communs et de telle nature, qu'ils se trouvent dans toutes, ou presque toutes les circonstances, toujours à la disposition du chirurgien, et de tout le monde; et,* qu'en l'absence *de l'homme de l'art, ils puissent être appliqués facilement par le* premier-venu, *après une très-legère instruction. En d'autres termes; trouver un moyen simple, facile à appliquer, sans cesse sous la main, ou qu'on puisse toujours se procurer, et qui soit propre de tenir lieu de charpie, de compresses, de remplissages, de bandes, bandages et liens, tels que la chirurgie les reclame pour toute espèce de pansement.*"—Nouveau Système de Deligation Chirurgicale, Paris, 1832.*

* To reduce as much as possible all kinds of apparatus to their most simple expression, by making them dependent upon one particular and uniform principle; in order that the parts of such apparatus, or the material objects of any dressing, may be

A principle which cannot be too highly appreciated, nor too generally adopted. M. Mayor has eminently succeeded in carrying it out; and although for many years exposed to the sneers and ridicule of his professional brethren, his plans of treatment are meeting everywhere with the respect they merit, and are daily becoming adopted, not only in very many parts of the Continent, but even in this country. While the author was in the service of Belgium, they had already begun to be put under experiment; and he was much pleased, as he had had ample occasion of witnessing their superiority, to find, during a visit he paid to that country in the spring of the present year, that they were in *general use*, and notably so in the Great Military Hospital of Louvain.

It would be impossible in a manual of this description to consign all that celebrated surgeon's objections to the common modes of dressing and bandaging, or give the fullest details of his method of treatment: the author will, however, condense the

so common, and of such a nature as to be met with under every or nearly every circumstance, no less at the disposition, always, of the surgeon, than of other persons; and that, *in the absence* of the man of art, they may be applied with facility by the *first comer*, after very little instruction.

In other words, to find out a means, simple, easy of application, ever at hand, or at least always procurable, which may replace lint, compresses, bags, bands, bandages, and ligatures, such as surgery ordinarily requires for the various species of dressing.

most interesting matter found in M. Mayor's plans, to the best of his abilities, and at an early opportunity bring before the public a translation of the remarkable work just cited, from which many valuable hints may be derived, even by those who would not feel inclined to abandon, altogether, the older and still more usual methods employed in the treatment of surgical accidents. In the mean while it is urgently recommended to those who are masters of the French language, to procure the original work.

It has not been M. Mayor's object, for he expressly states it, to banish wholly from the domain of surgery, charpie, lint, bands, &c. notwithstanding that such would be rigorously possible; but he had been so often struck with their abuse and their almost exclusive employment, that he could not forbear exposing their numerous inconveniences in practice, and endeavouring to establish his own motives for what he admits to be their *quasi-exclusion.*

The principal reproach made by that gentleman, on the subject of common bands, is in relation to their frequent absence in the time of need, and the occasional impossibility of procuring them: then, with respect to their application, to the serious inconveniences with which this may be attended when performed by unskilful hands; for it is an undisputed fact, that even under the best in-

structions the habit of applying them is slow in being acquired, and susceptible of being speedily lost. Bands, too, are subject to become relaxed, easily deranged, *corded;* and thus inflicting injury in a variety of ways, their frequent reapplication is of essential necessity: their diversity of length and breadth is always more or less perplexing; to roll them well not a little troublesome; and when to these well-founded objections to their exclusive employment, is added, the difficulty of having them always clean and neat, as well, also, as the little care that patients take of them when they are not absolutely wanted, it must be evident that some other means are requisite, to rid the surgeon of so many causes of vexation and embarrassment; and surely, when such are found, they must be hailed by the profession with something like satisfaction.

As a bandage is acknowledged to be injurious which effects an unequal pressure, and becomes corded or otherwise deranged, it must appear quite evident that, were a certain degree of thickness afforded it, together with the greatest possible breadth, these effects would be readily obviated. Now, all the inconveniences here spoken of may be avoided, and all the good desired, obtained, from a bandage either of the original form of a cravat or pocket-handkerchief, or of the principal *deligatory* modifications of this, adapted to the nature of the case. M. Mayor makes four modifications of a

handkerchief or cravat-shaped piece of linen, subservient to all the objects of a bandage. These are, the *oblong*, the *cravat-shaped*, the *triangular*, and *cordiform*; the latter is only employed to substitute a cord, or strong tie, in certain apparatus, and is obtained by twisting a cravat.

None of the objections made to the ordinary band can be applied to this species of bandage. The latter is found everywhere, and under every circumstance; is easily adapted; is not liable to become relaxed or otherwise deranged, and cannot become corded; is easy to fasten; may be changed and re-applied with the utmost promptitude, as a single circumvolution of it is often equal to a multitude of turns of the common band; is also more economical, as it will be always washed, and made ready to apply to other than surgical purposes; the thickness and breadth can be varied at will: in short, it is so much the more perfect as it forms one whole, while each turn of a common band, being considered as a piece apart, the derangement of one necessarily entails the derangement of all the rest.

It is not pretended by M. Mayor, let it be again observed, that this new description of bandages can supply, *completely*, the place of common surgical bands; for, as he justly observes, there are cases which require a methodic compression of a certain energy, more particularly some affections of the

breasts and of the extremities, but these are comparatively rare; and exception being made of such, the new description, as being the most valuable, should be employed *in common*, while bands should form but *the exception* to this general rule.

The application of the new system will be found in the second part of the work under the heads of the respective bandages.

With regard to the advantages derivable from the substitution of soft rag for charpie, in the view of economy, little need be said, as the latter article is in this country so rarely used; still, the common objections to the employment of charpie will in many instances be found equally applicable as regards lint, and more particularly in this, that lint, like charpie, cannot be washed; like it, too, it often becomes musty in campaign, on board ship, or in colonial settlements; and, consequently, its application afterwards to wounds would be highly injurious.

What is the end proposed in the application of lint or charpie to the surfaces of wounds? Is there in either one or the other any intrinsic medical virtue? or are they simply placed there, to serve for protection, while nature and constitutional remedies are actively engaged in operating the cure? Why may they not be replaced by old linen, which is not only as soft and as free from stimulation, but, if judiciously selected, quite as penetrable. Pieces

of old linen are applied as easily as lint, more easily than charpie, and may be lifted off with greater facility than either, causing the patient by no means so much pain.

In short, linen rag possesses striking advantages, not only in the cases wherein water is used as a remedial agent, or rather as an auxiliary of nature, but even in those in which cerates and ointments are still employed,—remedies happily becoming every day more rare as the state of surgery improves.

In some particular surgical diseases, the affected surfaces require a sort of bedding of a very soft and supple character, and to fulfil this indication something is exacted of the nature of lint or charpie: this species of material is necessary also for the construction of *tentes*, &c. in sinuses and fistulous openings. Now, instead of lint or charpie in such cases, M. Mayor strongly recommends the use of *Carded Cotton*. This substance is much more abundant, lighter, and easier of application; it adheres so much better that it rarely requires the superaddition of a retaining bandage. With respect, however, to the latter quality, this might in certain circumstances be considered an objectionable one; but in point of fact, where, in the subtraction of the cotton, the nascent cicatrix might be endangered from the attempt at tearing it suddenly away, every possibility of accident may be obviated by moistening it well with warm water, and it will

thus be found to detach itself with the utmost facility and in mass.

It would be sometimes, perhaps, advisable to apply round the edges of the wound a *protective bandelette*, or, where the wound is not very extensive, to cover the whole application with a piece of adhesive plaster: when this is taken off, the whole mass usually follows without any dragging. However, the ordinary kind of bandaging requires to be defined, and its arrangements pointed out as followed in the more customary practice.

BANDAGING is understood to be the confinement in their proper situation of dressings and other surgical remedies; and also of those parts of the body, which, from a previous state of displacement, the surgeon has restored to their natural position. It is effected by one or more rollers, linen, &c. or certain mechanical contrivances.

Bandages are called *simple*, which result from the application of the roller only, as the compressive bandage for ulcers on the leg, that for the suppression of hemorrhage from the temporal artery, the capeline, &c.; and *compound* when they bear a complex form of preparation, such as the T, the split-cloth, the eighteen-tailed bandage, &c. and the herniary or other mechanical apparatus. They have received particular appellations from their direction or form, and uses: hence they assume from the first

the names of circular, spiral, reversed, and spica; and from the second those of uniting, dividing, compressing, expelling, and retaining.

Of the first kind, that called the *Circular* (*a*), is formed of horizontal circumvolutions, which almost entirely overlap each other. The *Spiral Bandage* bears its definition in the name; it is called by the French *rampant* (*b*), where the borders of the roller barely touch, and the circumvolutions are not very numerous: it is said by them to be in *doloires* (*c*), where the turns, somewhat less elevated, and consequently more numerous, overlap each other by about two-thirds of the entire width of the band. In some cases, as in applying, for instance, a roller to the leg, the turns cannot be laid down flatly, as the upper border will compress the salient part of the limb, while the lower one hangs loose. This inconvenience is obviated by reversing it at every

turn, so that the superior border becomes the inferior, and the external face the internal: the hand should press lightly over each reverse to flatten and equalize it. This is the *Reversed Bandage* (*d*).

Two things are to be observed in applying the reversed bandage; one is, not to unrol, in making the angle, more of the band than is absolutely necessary; the other, to carry the angles upwards in a perpendicular line, and always far from the part affected.

When the turns of the roller cross each other in the form of the Greek *lambda*, and leave the band about one-third discovered, the Λ's being applied upon each other, the bandage receives the name of *Spica* (*e*): it is said to be ascendent when the doloires are directed towards the superior part of the member, and descendent when they regard inferiorly.

Of the second kind, the *Uniting Bandage* is that which is used in incised wounds; it should be adapted to their direction according as they affect a longitudinal or transverse course more or less complete: for longitudinal wounds it is constructed with a double-headed roller, the breadth of which ought to correspond to the length of the wound: a longitudinal slit is to be made in the middle, in order to allow the surgeon, when applying the bandage, to pass through it the head of the roller, and bring together the edges of the wound; this bandage

takes the form of the spica descendens. Or it may be made for such wounds with a single-headed roller, by dividing it at one end to a convenient distance into three tails, and making a little way beyond the termination of these, three longitudinal openings to receive them. The uniting bandage for transverse wounds consists of two strong linen bands of the width of the wound, and as long as the member; one of these is to be split to about half its length into two or three tails or bandelettes, and the other perforated in the middle with three corresponding longitudinal openings. See Part II. Sec. 4. Bandages for longitudinal and transverse wounds of the thigh.

The *Dividing Bandage* is that which is used in the treatment of burns, and of wounds attended with great loss of substance, for preventing the formation of seams or unsightly cicatrices.

The *Compressing Bandage* is that employed for exerting compression in sprains, œdematous swellings, callous ulcers, varices, aneurisms, erectile tumours, &c.

The *Expelling Bandage* is employed in the treatment of ulcers, deep-seated abscesses, contused wounds, &c. It is composed of a roller applied over graduated compresses, upon the region wherein the pus or blood is lodged, to which it is desired to give issue; it prevents these fluids from insinuating themselves along the interstices of the muscles, de-

taching the skin from its adherence to the subjacent parts, and forming sinuses.

Retaining Bandages are those which serve to confine dressings and displaced parts in their proper situation. Into this class enter herniary bandages, and those for fractures and dislocations.

A general rule to observe, in applying a common roller in the construction of these bandages, is to take the cylindrical part of it in the right hand, and hold the initial end between the thumb and finger of the left; then applying the external face of the latter upon some point of the circumference of the part, and retaining it there for an instant under pressure of the fingers of the same hand, to unrol the head and pass a few circulars about it, of moderate tightness, in order to fix it. The head in being unrolled should be held between the thumb and two first fingers, or between the thumb and index finger alone, so that it may turn upon its axis, and in this way it is much less liable to escape than when held in the palm: each time it changes hands, the one that receives it should unrol so much only as will allow of its arriving at the point at which it should pass into the other. A bandage is useless which does not give the most perfect support to the parts, maintain them in the position necessary to ensure the fulfilment of the indication proposed, and exert on the member an equable compression: for this, they require sometimes to be moistened,

which will occasion them to sit more firmly. When applied too tight, or when the compression is not uniform, very serious consequences arise, such as œdematous swellings, and even mortification: they should always be terminated opposite to the affected part.

In the department of surgery which constitutes the subject of the present work, more perhaps than in any other, is the practitioner's reputation exposed to the severity of criticism; and on the degree of knowledge and dexterity which he evinces in this, to be attested by the greater or less acuteness of the patient's sufferings, the duration of the treatment, and the issue of the case, will be found to depend the favourable or unfavourable general opinion of his talents: the majority of people can only appreciate what is palpable to the senses in the practice of the healing art, and therefore it is not surprising that they exercise their privilege of criticism to its utmost limits here.

Simple wounds are usually treated by *first intention:* but before bringing the edges into contact, it is necessary to observe whether they offer the following essential conditions: namely, when recent, bleeding surfaces; when suppurative, small vermilion cellulo-vascular granulations. When, therefore, it is resolved to treat a wound by first intention, and its state appropriate to that measure is fully recognized, the surfaces and neighbouring parts should

be carefully cleansed by means of warm water, and the edges so brought together, that, if such be possible, tissues of the same nature may be accurately juxta-posed. It is hardly necessary to observe, that, prior to this, should there be any hairs in the neighbourhood of the wound, they are to be carefully shaved off. To effect then this union, the fingers should be applied on each side, at some distance from the borders, the degree of pressure being regulated by the depth of the wound. When the edges are thus brought in contact, they are to be maintained until cicatrization be effected by aid of agglutinative bandelettes, uniting bandages, or sutures, according to the circumstances of the case.

The following rules should be carefully observed in the application of the agglutinative bandelettes; the skin and muscles of the part being brought as much as possible into a state of relaxation, and the edges of the wound maintained in apposition by means of the thumb and fore-finger of the left hand, (unless the wound be extensive, in which case the charge should be confided to an assistant,) the surgeon takes hold of the two extremities of a strip of plaster—previously warmed before the fire or the flame of a candle—and applies one of them upon the *least* moveable lip, at the part where the wound is deepest or most difficult to close, and at a right angle with respect to its direction; this done, he confines it by pressing thereon the point of one

of the sustaining fingers, and carries over the remainder of the strip to the *most* moveable lip: applying the rest of the pieces side by side, and according to the rules just laid down, the edges of the wound will be found not only in perfect contact, but sustained in the most effectual manner.

The intervals between the straps are to be regulated by the extent of the wound. In those of a large extent they should be an inch apart, otherwise three or four lines.

When the strapping is to be removed, which is generally done the fourth or fifth day, the surgeon lays hold of one of the extremities of each piece in succession, and gently raising it, reflects it upon the wound. This extremity being detached to within half an inch of the edges, he detaches the other to about the same distance, and holding them together, lifts them perpendicularly, taking care at the same time to apply the thumb and index finger of the left hand upon the sides of the wound, to prevent injury being done to the cicatrix. When the bandelettes have been applied, the parts should be covered with lint or light compresses, which are to be retained by an appropriate bandage. The part should then be placed in such a position as may be deemed the most favourable for the preservation of contact of the divided edges, and a state of repose enforced.

Suppurating wounds desired to be healed by *se-*

cond intention, should, after being cleansed, themselves and the neighbouring parts, be covered lightly with a dressing of rag or lint, or if charpie be used, a cribriform compress in the first instance, smeared if necessary with the smallest quantity of simple ointment, to effect its more easy removal. In recent wounds, the dressing, according to the opinion of some surgeons, should be allowed to remain on until it becomes sufficiently saturated by the purulent serosity constantly exuding from the surface to allow of its being readily detached. When, however, the suppuration is very abundant, or either it or other exudations become so altered as to disengage a fœtid odour, the whole dressing should be changed without delay; this also should be done when, from the swelling of the parts, the dressing becomes too tight, and occasions pain.

In recent wounds in general, the first dressing should be removed about the third or fourth day in summer, and in winter the fourth or fifth. But in wounds already in suppuration, the second and successive dressings should be made every twenty-four hours.

There are some surgeons who prefer squeezing at short intervals from a sponge, luke-warm water over the suppurating surface, enveloping the part on which the wound exists in *oiled-silk*. This simple practice as regards common suppurating wounds cannot be too highly esteemed; it is one which the

author strongly recommends, having observed it in every instance in which he has seen it adopted, attended with the most favourable results. Others have employed lead-leaf to cover the surfaces of suppurating wounds, and, according to their affirmation, with very great success.

In certain complicated wounds, as, for example, where sinuses are present, charpie, or, according to the recommendation of M. Mayor, cotton should be introduced to fill them up, and induce the necessary irritation: should neither these means, nor an enlargement of the opening, nor a counter-opening succeed, compression should be exerted by plumasseaux of charpie, pledgets of lint, or graduated compresses, assisted by a bandage adapted and regulated according to circumstances. At the time of each dressing, stimulating injections ought to be employed so as to provoke adhesive inflammation.

In *Lacerated wounds*, the more simple the dressing, and the more softly applied, the better, to guard against the ill effects of supervening inflammation; sticking plaster, in such cases, should if possible be dispensed with.

Wounds from Fire-arms differ but little from other wounds as regards their dressings. These consist of applications of soft rag, saturated with plain cold water, or refrigerant lotions, as this description of wounds is generally benefited by the employment of cold; but it sometimes happens

that, so far from relief being derived from such applications, the pain increases in intensity; in such cases warm emollient cataplasms should be immediately substituted.

Before closing the subject of dressing wounds, it would be as well to offer a few remarks relative to certain precautions which it is occasionally of great importance to observe. The surgeon should always place himself upon that side of the patient upon which he is to act, in order that his movements may be entirely unrestrained. Unless in cases where compression is indicated, the dressings cannot be laid on too lightly. The position of the patient should be always attended to, so that he may be as little fatigued as circumstances will permit; and as means of protection in case of severe injuries, in extensive and painful wounds, for example, some mechanical contrivance should be employed, such as the fracture-box or bridge, to sustain the pressure of the bed-clothes. When charpie is employed, the non-adherent couch should be removed in mass, and the remaining fibres detached, in cleansing the wound, by means of the dressing forceps. When rollers are used, and the same roller is to serve for a second or subsequent dressing, it should be re-formed at the time of its being unwound from the part. As it is of importance not to expose a wound longer than is absolutely necessary to the action of the air, which may be considered

in most instances injurious, it is always better for the surgeon to prepare beforehand the objects of which the dressing is to be composed, in order that they may be taken in regular succession and applied with celerity. Lastly, no means ought to be neglected for protecting nascent cicatrices; the albuminous couch which covers the granulations, and the pellicle which extends from the edges of the solution of continuity to the centre, should be always left intact, as they are the first products of cicatrization.

It is necessary now to enter into some details upon the principles on which dislocations, fractures, and herniæ are reduced and treated; the author will do this as fully as the nature of the work permits, and proceed at once to the description, application, and uses of bandages in particular.

1. *Dislocations.* — There are certain conditions necessary to the coaptation of the ends of displaced bones; the muscles which offer resistance to the reduction by their contractile powers, must be put into a complete state of relaxation; and when this can be done by merely affecting the position of the parts, the difficulty is at once ended, but most frequently it requires the application of an extending and counter-extending force; and even this requires, in certain cases, to be seconded by therapeutic agents, such as are calculated to diminish the great muscular strength of the patient;

all attempts at reduction will prove fruitless, unless the bone with which the dislocated head is naturally articulated be kept in a permanently fixed position by means of the counter-extending force; the extending force should always be in relation to the degree of muscular resistance, but always more powerful. It is important to take into consideration the causes of the displacement, in order to be guided in the direction in which extension should be exercised; it is found that the head of the bone becomes more readily disengaged from its new situation, and returned to the articular cavity, in being made to follow the same course which it took in quitting it.

With respect to the part of the member upon which the extending force is to be applied, a great difference of opinion prevails; the ancients as well as many modern surgeons of great eminence, to cite only, Pott in our own country, and J. L. Petit in France, preferred applying it to the luxated bone itself; but the French, in general, make extension from the most distant point possible of the bone with which it rests articulated; and Sir A. Cooper even sanctions the latter method in the reduction of a dislocated humerus: two great advantages they believe accrue from this; first, the reduction is not impeded by the spasmodic contractions occasioned by a compression of the muscles which surround the dislocated bone; and secondly, by making use,

as in this case, of a longer lever, the extending force is rendered more considerable.

The fixed point with which the counter-extending force is connected, must at all times be sufficient to resist the traction between these two powers, and the extension may be operated by means of multiplied pullies, or a sheet or towel applied round the limb, and pulled by a sufficient number of assistants; both forces may in less difficult cases be exercised by assistants only: however the extension be employed, it should always at first act in the direction that the luxated bone actually presents, and then by little and little in its natural direction; if effected according to the first of the above methods, it is recommended to place the member in a state of demiflexion; the extension should be effected gradually, beginning with the smallest, and increasing to the highest degree of power necessary; as well as gradual it should be continual, for if done by shocks, the greatest difficulties will supervene from spasmodic muscular contraction. Pressure ought never to be made either upon the articulated cavity or upon any point between this and the head of the bone; the extending force should act upon a broad surface, so as not to excoriate the skin, and it is well in many cases to apply about the part acted on, a quantity of tow or other soft material.

The therapeutic agents employed in cases of

great difficulty are bleeding, the warm-bath, antispasmodics, and the tartrate of antimony and potash. The state of intoxication has been found also favourable to the reduction. Professor Cooper informs us that the greatest advantages have been derived from the employment of the emetic-tartar, and the author's own experience has tended to convince him, also, of its efficacy. It is not easy to assign a period after which attempts at reduction become useless and even dangerous; this is particularly the case when sufficient time has elapsed to allow the torn fibrous capsule to become consolidated, the articular cavity to become nearly or entirely obliterated, the ligaments and cartilages to become so enlarged as to fill the space formerly occupied by the end of the displaced bone, and lastly, when it has permitted the latter to become so adherent to the parts in its new situation as to be confined by a new bony socket. Spontaneous dislocation, which originates in ulceration or suppuration of the joint, is irreducible, from the ligaments being destroyed, and the brim of the acetabulum annihilated; but it is not so when it is owing to an extraordinary degree of looseness of the ligaments, although a recurrence of the dislocation is liable to happen from the slightest causes. Certain it is, that the ginglymoïd articulations cease to become reducible sooner than the anarthrotic; much, however, seems to depend upon the patient's age,

and the more or less relaxed state of the muscular fibre. Sir Astley Cooper allots usually the term of three months to the attempt at reduction of a luxated humerus, but of two only in dislocations of the hip.

If it is remembered that a dislocation can only happen when the bone is surprised by some external violence at the instant when the axis of its body or extremity may have taken an oblique direction relatively to the surface with which it is articulated; it will appear evident, that when the luxated bone is reduced, all that remains to be done is to keep it in a state of immobility: the means to be employed for this will be mentioned in the second part of the work, in treating of bandages in particular.

2. *Fractures.*—Little need be said of the reduction of fractures after having spoken of the means to be employed in that of dislocations; the general principles are the same: the French apply the extending force to that part of the limb which is articulated with the lower end of the bone, and the counter-extending force to that which is articulated with the upper; the object which the French have in view in not applying these forces upon the fractured bone, is to avoid an irritation of the muscles, that might cause a spasmodic contraction and impede the efforts at reduction; thus, in fractures of the thigh, the means of extension act upon the

lower part of the leg, and those of counter-extension upon the pelvis.

The doctrines taught in our own schools, inculcate as a leading principle the necessity of putting the limb in a position capable of relaxing the more powerful muscles connected with the fractured bone, and of employing the extending and counter-extending forces to act upon the bone itself: this, however, being found defective in the reduction of a broken thigh, preference is given here to the former method; there are other exceptions also to this plan of reduction, where, for instance, the application of the reductive means at a distance from the affected part, is necessitated by the peculiar disposition of the part itself; thus, in fractures of the clavicle, the extension must be practised upon the arm and shoulder, and the counter-extension upon the trunk: neither is the French mode, above mentioned, capable of universal application, as is seen in fractures of the lower jaw; extension in these cases can only be operated upon the bone itself, in order to put the fragments into contact. There are fractures in which coaptation alone suffices, the displacement being due to the external cause which produced the accident; such are, for example, those of the bones of the head, the nasal bones, the ribs, &c.

The direction in which extension is to be employed is relative to that affected by the displaced

fragment itself; thus, in oblique fractures of the humerus, if the lower fragment mounts on the inside, the extension should be made obliquely downwards and outwards, then downwards, in order to restore it to its natural position. The degree of force necessary to be employed is no more appreciable, *à priori*, in fractures, than in dislocations; it must always be in relation to the kind of displacement and to the resistance of the muscles of the part. When sufficient extension has been made, the broken ends of the bones are to be placed in their natural situation, or, as is said, coapted; the surgeon proceeds in fractures of the limbs by acting upon the lower fragment, to regulate their contact, and should he deem it indispensably necessary to apply his fingers directly on the fracture, he should do it as lightly as possible, to avoid pressing the soft parts against the splinters.

With respect to the means of keeping fractures reduced, it is to be first observed that a multiplicity of causes would tend to disconcert the coaptation of the fragments, were not effectual means resorted to by the surgeon for rendering them immobile by the use of appropriate apparatus. Nor is the position of the part and even of the whole body a thing of small importance. "The most favourable position," says Professor Cooper, "for a fractured limb, is that in which all the muscles passing over the fracture, and extending either to the lower fragment or

to that part of the limb which is articulated with it, are equally relaxed; the injured limb should also have a firm support at every point, and its position ought to be so regulated, that not only this object be carefully fulfilled, but at the same time the chance of displacement from the action of the muscles, or the weight of the body or part itself, may be diminished as much as possible." The bed on which a patient ought to be placed, who is labouring under a fracture, should be narrow, so as to allow of the surgeon getting conveniently at the limb: the patient should repose upon a mattress, and never on a feather-bed. Baron Boyer recommended as the best pillow for supporting a broken limb, one stuffed with oat chaff; he considers it also less heating than a pillow of feathers, and less apt to soil.

Dessault and Baron Boyer recommended, in fractures of the thigh-bone, keeping the limb in a straight posture; and of the various apparatus invented for the purpose, that of the last of these distinguished surgeons is perhaps of all others the best calculated to fulfil the indications proposed by this method of treatment. Pott considered the best position to be that in which the limb is laid upon its outside with the knee bent, the fractured bone resting on the great trochanter, while the leg and foot are supported by smooth pillows, and slightly elevated. Considerable objection has of late years

been made to Pott's method, principally on account of its leaving the lower part of the limb too movable and unsupported, and imperfectly fulfilling the proposed indication, namely, of preventing disturbance of the coapted fragments. Sir Charles Bell prefers placing the patient upon his back, and supporting the limb upon a double inclined plane; a machine is constructed for this purpose, which consists of boards ten or eleven inches in breadth, one reaching from the heel to the ham, and the other from the ham to the tuberosity of the ischium; they are united at an angle at the knee joint, and their lower ends are united together by a horizontal board; cushions are placed on this, and upon all, the limb in a bent position. After the fracture has been reduced, a long splint is applied from the hip to the knee, and another along the inside of the thigh: the lower part of the apparatus is furnished with a foot-board for preventing the foot from being turned outwards, and keeping the limb steady.

Each of these methods has its partisans, but the general opinion appears to be fast growing in favour of the latter, both here and on the Continent.

A means of preserving the immobility necessary to the favourable progress of reduced fractures, has of late years engaged the attention of practitioners,

namely, by the employment of plaster of Paris: the limb is embedded in this substance to a certain extent, this, in becoming hard, renders all motion of the fragments impossible. The method just cited, appears best indicated in fractures of the middle and inferior parts of the lower extremities, where the patient is unmanageable, and there is no inflammation of the parts; its practice seems to have been hitherto attended with success, and may at all times serve as an adjuvant to the ordinary methods of treatment.

A difference of opinion prevails in the profession as to the real advantages derived from the compression of the limb by means of bandages; the French greatly inculcate its necessity, but Assalini disapproves altogether of the employment of tight bandages, and of covering the whole of a broken limb with splints: he treated at Paris a transverse fracture of the patella, by placing the limb upon a concave splint, the shape of the latter being adapted to the under surface of the leg and thigh. No bandage was employed in this case; two leather straps were crossed upon the knee and included the fractured bone: he afterwards treated fractures of the thigh and leg upon the same principle, employing in cases of the former, a hollow splint to receive the thigh, with two lateral branches going from it along the leg. The apparatus has a kind

of sole also, for the support of the foot; it is simply fastened with a few straps. The advantages of this method are, that the practitioner has the whole front of the limb in view, and may apply the dressings readily in cases of compound fracture.

In the appendix to the first edition of this work, was given a description of the apparatus of M. Sauter of Constance, modified by M. Mayor, for the treatment of fractures without splints, together with the means of its application. This method was first brought before the public in the year 1812, in a work published at Constance, by M. Sauter, and entitled, "*Instructions for treating safely, commodiously, and without splints, fractures of the extremities, particularly the complicated ones and those of the neck of the femur, by a method new, easy, simple, and the least expensive.* This work, published in German, was somewhat voluminous; and in order to render the subject matter more intelligible, M. Mayor translated freely whatever appeared the most prominent features of this novel invention, and published them in the form of a *Mémoire.* Perceiving fully all the vast advantages derivable from the new system, he adopted it exclusively, and having submitted it to the test of fourteen years' experience and observation both in the Hospital of Lausanne and in his private practice in the Canton, which was very extensive, he pub-

lished under the title of "*Mémoire sur l'Hyponarthécie*," the various modifications he had deemed it necessary to effect, to give to the mode of treatment its greatest efficiency. His reasons for adopting the term *Hyponarthécie* (υπο, under; ναρθηξ, splint) were based upon the fact that the *planchette*, or support of M. Sauter, upon which the limb reposes, is in itself a splint. This term is expressive of the system, and possesses the advantage of being capable of employment adjectively.

The author will not enter into the subject of objections constantly brought forward against the older apparatus, by reason of their common inefficiency, and, at times, really injurious qualities; and even the more modern improvements, such as those of Earl and Amesbury, simply on account of their expensive construction, which in very many circumstances totally precludes their employment, but will at once point out, and in the most concise manner possible, the more prominent advantages of the new principles.

To set out, the problem proposed by M. Sauter, a problem so difficult that it almost seems a paradox, but which he has so ably resolved, was "*to treat a broken limb, with even the most serious complications, by position only, and without the use of splints*; *and to permit the limb, at the same time, to execute, without pain or inconvenience, every move-*

ment parallel to the horizon." Now, to effect this important object, recourse is had to a board properly cushioned, upon which the injured limb is placed, and fixed in the position which it is necessary to give it; and the board thus charged, is attached to the ceiling or the top of the bed by means of cords, which are run through holes pierced in its borders and suspend it above the bed, so as to allow it a free horizontal motion. For the purpose of fixation of the limb, two or three cravat-shaped ligatures are employed, which, in case of need, and with a certain modification of this apparatus, namely, a foot-board or ladder, will equally serve for the execution of traction or *extension*. But these ligatures, as well as fixing the limb, exert a specific action upon the fragments themselves; for, acting in contrary directions, (see hyponarthecic figure at the article, Fractures of the tibia,) they keep the fractured ends of the bone themselves, as well in perfect juxta-position, as in the most complete immobility: so that this simple contrivance not only effectually operates the necessary traction in the axis itself of the bone, but even similar tractions directly transverse to it; an advantage by which it is distinguished above all other fracture apparatus. This state of immobility is importantly seconded by the soft cushion, which, moulding itself to the form of the limb, guarantecs the security of its under part, or that which alone can be said to be ex-

cluded from the direct action of the transverse ligatures.

But how, it may be asked, are the involuntary muscular efforts of the limb to be controlled? The answer to this is, that they soon terminate even under ordinary circumstances, and they do so in this case so much the sooner, as they are not stimulated and kept up by the weight or offensive pressure of ordinary apparatus.

As the whole limb rests exposed to view, the inspection of the practitioner will discover at once the slightest possible displacement, which he will be enabled to remedy with the utmost facility; at the same time that he may employ every kind of therapeutic agent in the event of injury of the soft parts. And the patients possessing, even under the most serious complications of their fractures, the faculty of horizontal motion, their beds can be easily made, and all the other necessary offices as readily performed.

Not the least advantage peculiar to this apparatus is its ready construction; it may be made at all places and under any circumstances, even by the practitioner himself; for if, viewing the materials in detail, some of these may not be at hand, such, for instance, as the pulley for the cords to run through, affixed to the ceiling, or the hinges necessary to a jointed board, (see lithographs) or a gimlet to bore the necessary holes, substitutes may be in-

stantly found; as, a staple for the first, a bit of strong leather for the second, and for the third, a few nails, by which the cords may be effectually fixed to the edges of the board. So also with respect to the cushion, how many a substitute may be found for this! In short, whether a surgeon be called for, in scenes of the greatest poverty, on board ship with the fewest possible resources, or in the wildest districts, he need never be embarrassed.

The reduction of fractures, in the employment of this suspension apparatus is effected thus. The board being furnished with its cushion, which should be sufficiently thick to constitute a soft bedding, and entirely cover it, and the vertical cord, forming a loop, properly suspended from the ceiling; the second cord, destined to form the side loops, or arcs of the board, is to be run through the holes perforated through the angles of this, passing in its course through the first or suspension loop, so as to be in readiness to comply with the exigencies, in regard to length, when the suspension is about to be effected. This done, the limb is made to glide along the cushioned board; and then the resistance or *counter-extension* and traction, is resorted to, together with the coaptation of the fragments; and, by means of the traction-ligatures, the position and fixation of the limb is fairly established. The lad-

der or foot-board, or extension ligature, will now keep the foot steadily fixed, while the due elevation given to the centre of the jointed board, if this be used, will have constituted it an excellent double-inclined plane, possessed of all the advantages accorded to that species of apparatus. Lastly, the arc-loops and suspension loops are to be regulated so as to raise the limb to a proper height, which will be judged of by the surgeon, in consulting at all times, however, the feelings of the patient.

As this kind of apparatus is in the way of the bed coverings, some little tact is requisite to overcome this trifling impediment; but nothing need be observed on the subject here, as the good sense of the practitioner will always readily suggest means to remedy an inconvenience so truly unimportant.

The use of the jointed board is strikingly evident in fractures of the femur, whether of its shaft or neck: it effects, in its quality of double-inclined plane, that which only *modern* surgery has succeeded in obtaining; namely, permanent *Extension*, joined to double *Flexion*, and *Fixation* of the entire limb: but, besides this, suspension affords the utmost facility of motion in mass, by means of *lateral action*. It will be only necessary to observe this apparatus, as illustrated in the second portion of the work, in action, to be convinced how effectually the above important objects are attained, and how totally impossible it must be for the fragments of

the bone to ride in cases of oblique fracture, by reason of the powerful aid of the pelvic bandages.

Even in fractures of the upper extremities, the hyponarthecic apparatus may be sometimes advantageously employed; as, for instance, where the fracture is one of very serious character, and complicated, with injuries of the soft parts, which requires that the patient should keep his bed, and which precludes, from what cause soever, the application of ordinary apparatus, as tending to aggravate his sufferings, and augment the difficulties of the case. In short, the only circumstances in which the invention of M. Sauter is contra-indicated, are those in which infants or maniacs are concerned, for reasons which the least consideration will render apparent.

For all else that concerns the suspension apparatus, see the second part of this work.

3. *Herniæ.*—The only herniæ to be made mention of here, in what relates to their reduction, are those of the abdomen.

To operate the reduction of a hernia, it sometimes suffices to cause the patient to lie upon his back, and exercise a gentle pressure upon the tumour; but in general recourse must be had to the *taxis*, which is performed in the following manner:—The patient ought to be so placed that the muscles of the abdomen may be relaxed in the greatest possible degree; for this reason he is made

to repose upon his back, his head elevated by pillows, and consequently inclined upon the chest; his legs are to be flexed, his pelvis raised a little higher than the belly, and inclined a little to the side opposed to the hernia; he should remain motionless, and make the least considerable efforts of respiration possible. The surgeon, placing himself on the side corresponding to the tumour, lays hold of it with one hand by its base, and, directing it in the axis of the aperture, exercises on it a gentle and continued pressure, as if he were engaged in emptying it; then with the thumb and the three first fingers of the other hand, taking hold of it by the pedicle, he pushes the parts of the tumour nearest the aperture inside, and the rest by little and little, taking care, however, not to allow them to escape as they are gradually thrust within. When the tumour is very voluminous, the surgeon employs both his hands upon the pedicle, while an assistant makes compression upon the base. Difficulty is occasionally met with in returning the intestine, and then it will be found requisite to press it in different manners to free it of the fæcal matter which it generally contains in these cases in large quantity. Sir Astley Cooper recommends compression, if necessary, to be continued for the space of a quarter of an hour, when the parts will in most instances be found to yield.

The means employed in maintaining reduced

herniæ consist in keeping up an uninterrupted pressure upon the parts by means of bandages, which vary according to their seat, their number, the age of the patient, &c. More particulars relating to the after-treatment of reduced herniæ will be found in the second part of the work, in the description of Herniary apparatus.

PART THE SECOND.

ON BANDAGES IN PARTICULAR.

SECTION I.

BANDAGES OF THE HEAD AND NECK.

1. HEAD-BAND.

(Syn. Bandeau, Fr.)

Composition.—A piece of linen a yard long and a quarter of a yard wide, folded lengthways in four.

Application.—The centre of the head-band is placed upon the median line of the forehead, and the extremities, after being conducted to, and crossed at, the nape of the neck, are returned and pinned over one of the temples.

Use.—To confine dressings upon the forehead the temples, or the eyes.

2. Four-tailed Bandage of the Head.

(Syn. Fronde, Fr.)

Composition.—A strip of cloth a yard long and six inches broad, split at each end to within three fingers' breadth of the centre.

Application.—When the wound is on the forehead, the unsplit portion is applied there, and the two upper tails, carried posteriorly, are fixed at the back of the head; the lower tails are then fastened either upon the vertex or beneath the chin, as the surgeon may consider it more convenient. To confine a dressing upon the summit of the head, the posterior tails, *a*, are brought down and secured beneath the chin; the anterior tails, *b b*, after being carried to the nape of the neck and crossed, are fixed before the throat. In applying it to the nape of the neck, the upper tails are conducted over the forehead, from whence, after being made to cross each other, they are returned, and fastened at the occiput; the lower tails pass round the neck.

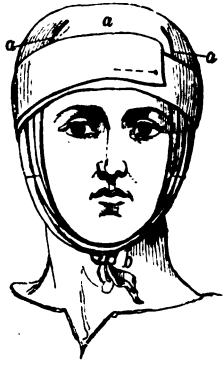
Use.—This bandage, a very simple and convenient one, is of great utility in wounds of the head, as it can be applied over every point of this part, by merely changing its direction.

3. Six-tailed Bandage.

(Syn. Bandage of Galien.)

Composition.—A piece of linen a yard long and a quarter of a yard wide, split at each end, to within three fingers' breadth of the centre, into three portions, the central being somewhat broader than the others.

Application.—The surgeon first reverses the posterior tails upon the central, and the anterior upon the posterior; placing the bandage upon the summit of the head, he takes the central tails, *a a a*, between the thumb and fingers of each hand, and passing them along the ears, secures them underneath the chin, *b*, observing, however, to fold the edges of each tail inwards so as to give it a triangular form, the base corresponding to the unsplit portion; the frontal tails are to be directed from the anterior to the posterior part of the head, where they should over-



lap each other; and the occipital tails at length brought forward and secured upon the brow.

Use.—The same as the preceding, but it has the double advantage of not being liable to displacement, and of confining a larger dressing.

4. Capelina.

(Syn. Capeline, Fr.; Reflex Capitis, Lat. Bandage of Hippocrates.)

Composition.—A double-headed roller.

Application.—The centre of the roller is placed upon the occiput. After two or three circles the rollers intersect each other upon the forehead and occiput; one of these being then reflected over the vertex to the forehead, the other is continued in a circular course. They next cross each other upon the forehead, when the first head is carried obliquely backwards to the occiput, and reflected by the side of the other. The last, *a a*, is continued in a circular direction, but the first, *b*, is again brought over the head, and carried in this way backwards and forwards in doloires till the head is entirely covered.

Use.—This elegant bandage serves to confine

dressings upon the head, but is rarely now employed; the ancients exerted, by its means, compression on the heads of hydrocephalic patients.

5. T Bandage of the Head.

Composition.—A band two yards long and two inches wide, upon which, at about one-third of the entire length, a bandelette half a yard long and of the same width, is stitched at right angles. The band is rolled up into two heads of different sizes.

Application.—Placing himself before the patient, the surgeon applies it to the middle of the forehead, the uppermost edge being that which corresponds to the vertical portion, *a*, of the bandage, in order that the latter, after traversing the vertex, may hang loosely upon the nape of the neck; he now unfolds the heads in passing them along the temples to the occipital region, where they cross the bandelette, which should be immediately reflected upwards, *b*, and secured upon the brow by a few turns of the larger head, *c*. A double T may be formed by simply stitching a second bandelette upon the transverse portion, at a convenient distance from the first.

Use.—Like all the foregoing, it is a retaining bandage; in the choice of these the surgeon must of necessity be guided by circumstances.

6. Fronto-occipital Triangle.*

Application.—The base is placed before the forehead, higher or lower according to circumstances; the lateral angles or *tails* are crossed at the occiput, from whence they are to be brought forward as far as the temporal regions, where they are to be fixed by means of pins.

The summit is then conducted and fixed at the occipital region, where it is made to pass under the posterior portion, from whence it is reflected upwards and pinned.

Use.—Same as foregoing.

7. Occipito-frontal Triangle.

Application.—Base at the occiput; tails crossed upon the forehead. Summit passed underneath the frontal portion and reflected upwards.

Use.—Same.

8. Bi-temporal Triangle.

Application.—Base upon one of the temples;

* The triangles and cravats, as well as the hyponarthecic apparatus described in the following pages, are all particular applications of the new system pointed out in the first Part. If the tails of the triangles and cravats should occasionally prove too short, they may be lengthened either by the addition of a second cravat-shaped piece of linen, an end of band, or a bit of tape.

tails crossed upon the opposite one, where the summit is to be fixed, *left or right*, according as the base may be left or right.

Use.—Same.

9. Nodose Bandage.

(Syn. Scapha, Lat.; Nœud d'Emballeur, Fr.)

Composition.—A simple band four yards long and two fingers' breadth wide, rolled up into two heads of unequal size.

Application.—The unrolled portion being applied over the graduated compresses, *a*, that cover the wounded artery, the surgeon conducts the two heads before and behind, to the opposite temple, where he crosses them in order to return to the point of departure; he now gives them a turn or twist, *b*, which enables him to carry one over the summit of the head, and the other underneath the chin, *c d*, to the sound side, where they meet and cross as in the first instance; from thence they are conducted in the same course, *e e*, to the point of departure, and a second twist being effected, they are conducted for the third time to the opposite temple, and for the third time

also returned horizontally and knotted: being conducted finally, the one head over the vertex, and the other underneath the chin, the bandage is terminated by a few circulars of the long head.

Use.—For stopping hemorrhage of the temporal artery, or of any of its branches; it may be conveniently replaced by a graduated compress and a single-headed roller, a few circulars of moderate tightness being all that is in general required to arrest the flow of blood.

10. Double T Bandage of the Nose.

Composition.—A narrow band about a yard long and half an inch broad, upon the middle of which are stitched at right angles, and about three-fourths of an inch apart, two others of the same breadth, and of about one half the length of the first.

Application.—The middle of the transverse band, *a*, is placed upon the upper lip, the two others being directed upwards; the extremities of the first are then conducted below the ears as far as the nape of the neck, where they are fastened by a bow; the vertical bands, *b b*, crossed at the root of the nose, are diverged upon the brow,

and carried along the parietal bones to the transverse portion of the bandage, under which they are made to pass, and are reflected upwards and secured.

Use.—Simply to confine a dressing upon the nose.

11. Another Bandage for the Nose.

(Epervier, Fr.)

Composition.—A piece of linen is cut into a triangular form, of sufficient size to cover the nose, with two holes perforated near the inferior angles to correspond with the nostrils; a triangular portion is cut out from the superior angle of this, the apex of which looks downwards on the median line; the divided edges are sewed together; a sort of bag is formed in this way, capable of lodging the nose exactly; to the lower part of the bag is stitched a narrow band half a yard long and half an inch wide, and to the summit a second band of like dimensions.

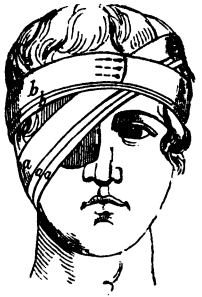
Application.—The bag is adapted to the nose; the surgeon lays hold of the inferior tails, and passing them beneath the ears, ties them in a bow upon the nape of the neck: he then conducts the superior tail along the sagittal suture as far as the transverse band, under which he passes it, reflecting the end upward to secure it to the descending portion.

Use.—The same as the foregoing.

12. Monocle.

Composition.—A single-headed roller four or five yards long and two fingers' breadth wide.

Application.—Two horizontal turns are first made round the forehead; the head of the roller upon reaching, for the second time, the nape of the neck, is carried under the ear of the affected side and obliquely upward to the eye, inclined towards its internal angle; pursuing the same direction, it crosses the forehead over the sound eye near the temple of the same side, to arrive again at the nape. Two or three more oblique turns being made in a similar manner in the form of doloires open inferiorly, *a a a*, the bandage is terminated by a few horizontal circulars about the brow, *b b*.



Use.—To confine a dressing upon the eye.

Observations.—This bandage, extremely elegant, has the disadvantage, however, of being easily deranged; to prevent this as much as possible, the head should be covered with a night-cap. It is not, at present, much employed.

13. Simple Oculo-occipital Triangle.

Application.—Base stretched obliquely from the superior part of the temporal region of the sound side to the submastoid region of diseased side; sum-

mit carried diagonally backwards to the posterior portion, where it crosses at the side of the nape corresponding to the sound eye.

Use.—Same as foregoing.

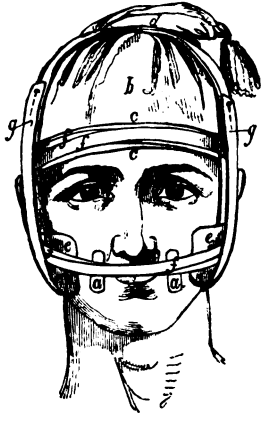
14. Double Oculo-occipital Triangle.

Application.—Base before the eyes; tails and summit at the occiput.

Use.—Same, but of course for both eyes.

15. Bandage for the Hare-lip Operation.

Composition.—Two small pledgets to be placed under the extremities of the needles, *a a*;—a moderate-sized roller;—a double-headed roller three yards long and a finger's breadth wide;—a bandelette four feet long;—two graduated compresses of sufficient thickness to prevent the uniting bandage when applied upon the cheeks from touching the needles;—lastly, a four-tailed bandage, page 54.

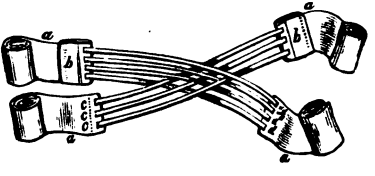


Application.—The patient's head being covered with a night-cap, *b*, which is fixed by a few circulars of the single-headed roller, *c c*, the centre, *d*, of the bandelette is applied upon the vertex, and the extremities allowed to hang

down on each side of the face; an assistant covers these with the graduated compresses, *e e*, which he places opposite to the commissures of the lips, at the same time that he pushes the cheeks forward. That done, the centre of the double-headed roller is applied upon the forehead; its heads are directed toward the nape of the neck, crossed, brought forward horizontally, first over the compresses, then the lips, where they are crossed anew, and returned successively to the occiput and forehead, *fffff*. They are made to continue this course until they are entirely exhausted, and the ends are fastened to the cap with pins: the extremities of the bandelettes are now reflected upward, and pinned upon the top of the head, *g g*, and the whole apparatus is secured with the four-tailed bandage of the chin, which see.

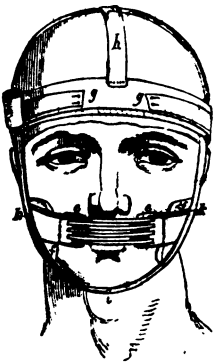
16. M. THILLAYE'S BANDAGE FOR THE SAME.

Composition.—Four pieces of tape are required, each about two feet in length, and broad in proportion to the depth of the lip, *a a a a*; to the extremities of two of these bands, which may be denominated posterior, are stitched two small linen pledgets or cushions, *b b*, about three-quarters of an inch square; while the two extremi-



ties of the others, or anterior tapes, are folded under to have more solidity. Upon the extremity of one of these, are stitched three strips of extremely narrow riband, *c c c*, three inches and a half long, to connect it with one of the pledgets, to which also they are to be in like manner fastened, with a small space left on the free edges: four strips of riband, *d d d d*, similar to the first, are stitched to the extremity of the anterior tape of the opposite side, which, after being passed through the intervals of the first set, are fixed to the other pledget. By this disposition the bandelettes attached to either of the anterior tapes will be found attached to the pledget of the opposite side; the free extremities of the tapes are then rolled up and pinned.—Two small graduated compresses, eight lines long by six wide;—two cushions large enough to occupy the space comprehended between the zygomatic arch on each side, and the inferior maxillary bone;—a single-headed roller of moderate size;—and two bandelettes, one a foot, and the other a foot and a half long.

Application.—The single-headed roller is first of all passed horizontally round the patient's head, to afford points for the fixing of certain parts of the apparatus; after which, an assistant applies at the distance of half an inch from the incised part, the graduated compresses, *e e*, which he retains in place while the surgeon applies the central portion of the



quadruple-headed roller upon the lip; the latter then carries the heads of the posterior bands to which the pledgets are attached in a horizontal direction, over the cushions, *f f*, placed between the zygomatic arch and the lower edge of the inferior maxillary bone, as far as the nape of the neck; from hence, after crossing each other in changing hands, they are made to ascend obliquely to the forehead, where the ends, *g g*, are pinned to the circles of the roller. Laying now hold of the anterior bands, he pulls them in opposite directions, and brings, by the aid of the pledgets, the edges of the wound into contact; the heads of these two bands pursue the same course as those of the preceding, and the ends are fixed in like manner to the circles of the roller.

The bandelettes serve to render the apparatus more secure; the first, *h*, passes along the sagittal suture, being attached before and behind to the circumvolutions of the roller; and the second being applied by its middle, *i*, to the chin, passes upward to the temples, where it is fixed to the same circumvolutions; a few stitches, *k k*, are inserted to

connect it with the cushions, and the whole is retained by the four-tailed bandage of the chin.

17. FRONTO-OCCIPITO-LABIAL TRIANGLE.

Application.—Base against the forehead; tails first crossed at the nape of the neck, then brought forwards to either lip, where one is passed through a slit perforated near the extremity of the other; these extremities are then pulled in contrary directions, and secured by a couple of small pins or a few stitches; summit carried to the occiput, passed under the first inter-crossing, reflected upwards and pinned.

Use.—To sustain the union, in wounds of the lip, or the hare-lip operation; and also to confine the dressings.

18. FOUR-TAILED BANDAGE OF THE CHIN.
(Syn. Fronde du Menton, Fr.)

Composition.—See Four-tailed Bandage of the Head, page 54.

Application. — The middle part is placed upon the chin; the two upper tails, *a a*, are carried simultaneously toward the nape of the neck, whence, after changing hands, they are conducted obliquely upward and forward to the forehead and pinned; the lower tails, *b b*, are

then directed upward, passing before the ears, and are crossed at the summit of the head, from whence they are returned and fixed beneath the chin.

Use.—To fix the apparatus of the hare-lip operation; it forms part also of the apparatus for fracture of the lower jaw, and is used to retain a reduced luxation of the condyles of that bone.

19. Parieto-mental Triangle.

Application.—Base at the vertex; tails first brought downwards and forwards to the chin, (which they embrace in inter-crossing,) and then carried to the nape of the neck and secured. Summit directed anteriorly or posteriorly, and pinned, if necessary, to a night-cap.

Use.—Same as foregoing.

20. Chevaster.

Composition.—A single-headed roller five yards long and three fingers' breadth wide.

Application.—The initial end of the roller is applied upon the nape of the neck, and fixed by a few horizontal turns about the head; the head of the roller is next carried beneath the ear opposed to the affected side, then beneath the chin, and finally upon the fractured side of the maxillary bone; from hence it is made to ascend, *a*, along the face and pass obliquely over the vertex to arrive behind the ear of the sound side; it pursues twice or thrice

the same circular course in forming *doloires, b b b,* open toward the median line of the face; it is then conducted round the neck in order to embrace the anterior part of the chin, *c*; still conducted onward, but more obliquely in order to surround the neck, *d*, it gathers up the plaits of the first turn, and after being made once more to describe a vertical circular, it exhausts itself in horizontal turns about the head.

Use.—In fractures of the neck of the inferior maxillary bone.

Observation.—Some graduated compresses are previously placed behind the angle of the jaw, in order that the turns of the bandage may determine a greater pressure, and consequently push the lower fragment forward.

21. Parieto-submaxillary Triangle.

Application.—Base at vertex; summit anteriorly; tails directed along the parotid regions, the posterior third of the submaxillary bone, and under the chin, where they are crossed; the extremities being fastened to the descending portion, near the ears.

Use.—Same as foregoing. The posterior border

should be pulled backwards so as to be made to envelope in the most perfect manner the ramus of the jaw.

Observation.—If only one side of the jaw is intended to be encased, the base of the triangle should be applied below the ear of the affected side.

22. Bandage for Fracture of the Lower Jaw, with Splint.

Composition.—An oblong piece of thick pasteboard divided at each end to within an inch of the middle;—a four-tailed bandage;—some compresses.

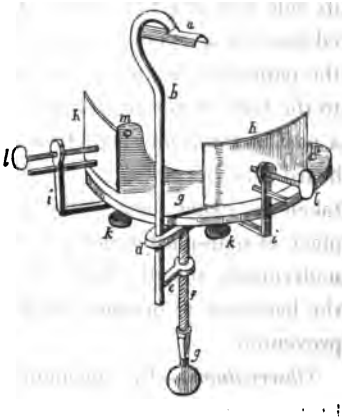
Application.—The pasteboard is previously wetted and softened with vinegar, and afterwards adapted to the outside of the lower jaw, both along its side and under its basis; over this the four-tailed bandage is applied, the centre being placed upon the patient's chin, while the lower tails are pinned to the front of the night-cap, and the upper ones to a part of the same farther back. When the pasteboard has become dry, it will be found to have taken the exact form of the parts, page 12, and a piece of soap-plaster being now applied to the skin underneath, any ill effects which might arise from the hardness or pressure of the pasteboard will be prevented.

Observations.—In recommending this bandage Professor Cooper remarks, Surg. Dict. p. 507, that "In order to keep the middle portion of the bone

from being drawn downwards and backwards toward the larynx, it is frequently necessary to apply tolerably thick compresses just under and behind the chin." "When the condyle is fractured, as it is incessantly drawn forward by the action of the pterygoïdeus externus, and on account of its deep situation cannot be pressed back, the lower portion must be pushed into contact with it. For this purpose the bandage must be made to operate particularly on the angle of the jaw, where a thick compress should be placed."

23. Mr. Lonsdale's Apparatus for Fracture of the Lower Jaw.

Composition.—A small plate of metal, *a*, fig. 1, grooved to fit on the teeth, is made to screw on a thin rod of steel, *b*, passing downward, and long enough to extend from two to three inches below the level of the chin; this rod is curved at its upper part, to prevent pressure on the lower lip. Upon the rod is made to pass up and



down a plate of wood, *c*, shaped to the base of the jaw against which it rests, by means of a slide, *d*; the chin-piece is raised or depressed by means of a screw, which passes through a small bar projecting backward from the lower end of the vertical rod, *e*, *f*, and turned by a key, *g*, made to take off, to prevent pressure on the chest when the head is inclined forward, and also to guard against the patient loosening the instrument himself. Pressure is made laterally by two small plates, one on either side, *h*, fixed to a small bar, *i*, moving on a pivot by means of a small screw, *k*, underneath, and projecting from the under part of the plate of wood upon which the chin rests; this bar stands out about three-quarters of an inch, and is then bent upwards at a right angle for an inch or more in length. Through this, at the upper part, a screw, *l*, passes, and is attached to the plate, which it can move backwards or forwards, and make to press laterally upon the jaw, more or less, according to the degree in which it is turned. The plate is steadied by a small bar fixed to it, sliding through the bar through which the above screw passes.

Fig. 2, represents a curved plate, grooved, to be screwed on the rod, *b*, when the fracture is on the left side of the symphysis.

Fig. 3, a plate curved for fracture on the right side of the symphysis, screwing to the rod, *b*.

Fig. 4, double-curved plate in cases of double fracture, to be fixed on the rod, *b*.

The teeth-plates should be washed with silver to preserve the saliva from acting on the steel, and producing a disagreeable secretion in the mouth.

Application.—After having padded the plate that rests on the teeth with lint, or leather, as well as the chin-plate, and the portions of bone being brought into as close apposition as possible, the plate, *a*, is placed on the teeth, and the plate, *c*, beneath the base of the jaw, the screw, *f*, is then turned until the portions of bone are fixed between the two plates. The instrument is prevented from slipping forward by a bandage that passes through the holes, *m m*, the ends of which are tied, the ones behind the neck, and the others at the top of the head. When the lateral pressure is required, it should be made by the screw, *l*, before the pressure is completed on the teeth, and the plate, *h*, should be lined by a pad of lint.

Observations.—The principle of the instrument, is to confine the portions of bone between two parallel forces, so applied, that the one presses down-

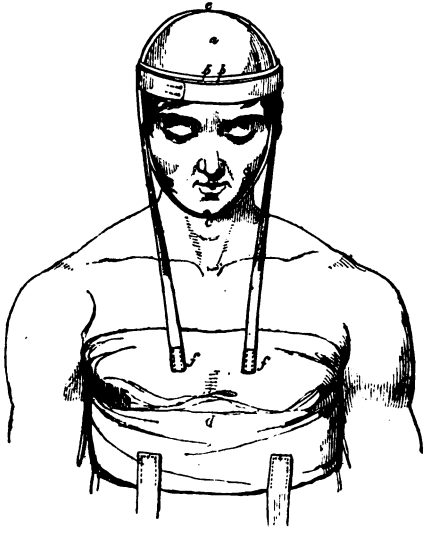
ward upon the teeth, and the other upward, beneath the base of the jaw.

Since the time of its being first announced (Medical Gazette, vol. xii. p. 565), it has been tried in many cases of fracture of the lower part of the inferior maxillary bone, and in all of them with complete success.

24. Bandage for Transverse Wounds of the Neck.

(Syn. Bandage flechisseur de la tête, Fr.)

Composition.—A single-headed roller four yards long;—a band a foot long and three fingers' breadth wide;—a body bandage with thigh-straps;—and a compress a yard and a half long by eight inches wide, folded lengthwise in four.



Application.—A night-cap, *a*, is fixed upon the patient's head by a few horizontal turns, *b b*, of the roller, which are made to fix at the same time the extremities of the band, *c*, placed by its centre upon the inferior part of the chin. The body bandage, *d*, is applied round the chest and pinned. The centre, *e*, of the compress being lastly applied upon the upper and back part of the head, and secured by a few more horizontal turns of the roller, its pendent extremities are firmly fastened to the fore part of the body bandage, *f f*.

25. Occipito-sternal Triangle.

Application.—Base at occiput; summit anteriorly; tails brought down along the sides of the head and face, and fastened to the front of a *sterno-dorsal* or *dorso-thoracic square*, or to a *dorso-thoracic cravat.**

Use.—Same as foregoing.

26. Bandage for Burns on the fore part of the Neck.

(Syn. Bandage Divisif du Cou, Fr.)

Composition.—A double-headed roller six yards long and three fingers' breadth wide;—a band a yard long and of the same breadth as the roller;—some soft compresses.

Application.—The band is placed on the summit of the head, its extremities hanging down in front

* The thoracic cravat requires no explanation; its application suggests itself.

of and behind the neck. The centre of the double-headed roller is next applied over the median line of the forehead, so as to cover the anterior extremity of the band, while the heads, conducted backward as far as the nape of the neck, are made to engage, in crossing, its posterior extremity; from hence they are conducted before the shoulders and under the axilla (where the compresses should be previously placed), to the patient's back, where they again intersect each other, and are returned to the forehead. Crossing anew at the forehead, they are made to descend, a second time, to the nape of the neck, and pursue twice or thrice more the course just described: lastly, the anterior extremity of the band is reflected over the vertex and fixed to the posterior part of the apparatus, and what remains of the roller is exhausted in horizontal turns about the head.

Use. — To prevent the unsightly cicatrization which often succeeds to these accidents; it may be used in all cases where it is required to keep the head backwards, as in transverse wounds, for example, of the back of the neck.

27. Fronto-dorsal Triangle.

Application.—Base upon the forehead; summit posteriorly; tails carried downwards and backwards, to be fastened to the back of a *sterno-dorsal* square, or a *dorso-thoracic cravat.*

Use.—Same as foregoing.

28. Bandage for Bleeding at the Jugular Vein.

Composition. — A ligature a yard and a half long;—a graduated compress;—a single-headed roller five or six yards in length and three fingers' breadth wide.

Application.—The patient's head being inclined to the side opposite to that on which the operation is to be performed, the graduated compress is laid upon the jugular vein at the lower part of the neck; the surgeon then applies the centre of the ligature upon the compress, and conducts the extremities one before and the other behind the chest, to the opposite axilla, where he ties them in a bow.

The operation ended, he passes lightly round the patient's neck a few horizontal turns, *a a*, of the roller, to confine the dressing; or a few such turns and three oblique circulars, *b b b*, carried underneath the opposite axilla, terminating always by one or two circulars about the neck.

Observations.—To avoid the ill consequences that might by possibility arise from the passage of air into the jugular vein, Baron Larrey recommends compression to be kept up until the wound is healed.

29. Cervical Cravat.

Application.—Centre before the larynx, the side of the neck, or against the cervical vertebræ, according to circumstances; constituting it *anterior*, *lateral*, or *posterior-cervical*.

Use.—As a retaining bandage for dressings applied to the neck.

30. Bandage for Wry-neck.

(Syn. Bandage de Winslow, Bandage rotatoire de la tête, Fr.)

Composition.—A single-headed roller three yards long and an inch and a-half wide;—some soft compresses or a cushion to protect the axilla against the pressure of the roller;—a napkin to surround the trunk.

Application.—The initial extremity, *a*, of the roller being directed toward the affected side, is placed upon the middle of the forehead and fixed by a few horizontal circulars; these should be secured with pins. The remainder, *b*, of the roller is then carried behind the shoulder opposed to the side affected, and under the axilla, where the cushion ought to be previously placed, to the fore part of the

napkin, to which it should be firmly stitched; care being taken, however, to pull it with sufficient force to restore the head to its natural position.

Use.—In cases of spasm or paralysis of the sterno-cleido-mastoïdean and platysma-myoïdean muscles. It raises the head, brings round the face forward, and, when the affected parts have been operated on, opposes itself to the contractile efforts of the antagonist muscles.

31. Professor Jörg's Apparatus for the same.

This apparatus consists of a pair of leather stays and of a band or fillet for the head; on the centre of the fore part of the stays is a sort of pulley or groove, which can be turned round with a key in one direction, but becomes fixed in the other, through the means of a spring; a band passes ob-

liquely upwards from the pulley to the fillet, to which it is attached behind the ear; when the

band is drawn downwards by the pulley, it lowers the mastoïd process and approaches it to the sternum; it counteracts in this way the antagonist muscles, and restores the head to its natural position.

32. Temporo-axillary Triangle.

Application.—Base upon the temporal region opposed to the side affected; summit directed to the temporal region corresponding to the side affected; tails fastened to an *axillo-acromial cravat* (see Section 3).

Use.—Same as the two foregoing.

SECTION II.

BANDAGES OF THE TRUNK.

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1. Dorso-thoracic Triangle.

Application.—Base across the anterior or posterior part of the chest, according to the seat of the injury; tails over-lapped and pinned; apex directed over one of the shoulders. To this point is attached a riband or something of the sort, which is carried down to the corresponding portion of the base and pinned.

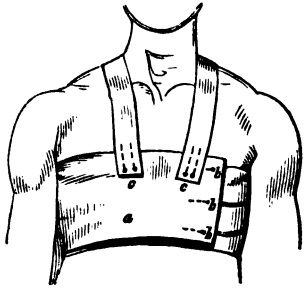
Use.—To retain a dressing on the fore or back part of the chest.

2. Body-Bandage of the Thorax with Scapulary.

(Syn. Dorso-thoracic Oblong.)

Composition.—A napkin, or large compress of the same form, folded lengthwise in three;—a band two feet long, split nearly to the end.

Application.—The napkin, *a*, is passed under the body, and the two extremities brought upward to



the chest, upon which they are made to overlap each other; they are then pinned, *b*; the unsplit extremity of the band being next fastened to the posterior part of the body-bandage, the tails are brought forward one over each shoulder, and secured in front, *c c*, to form the scapulary.

Use.—To confine dressings upon the chest; to furnish points for the attachment of parts of several other bandages: in dislocations of the head of the humerus it is made to embrace the limb and fix it against the thorax; the fore-arm in such cases should be suspended in a sling.

Observations.—Instead of being made simply to overlap, the ends of this bandage may be made to unite by lacing, by buckles, or by means of ties. The scapulary may be constructed either by means of a cravat, the middle of which is applied to the back of the neck, while the tails are brought forward to be attached to the fore part of the body-bandage, constituting the *cervico-thoracic cravat;* or by means of a triangle, the base being applied to the back of the neck, the apex attached to the body-bandage posteriorly, and the tails brought down over the shoulders and pinned to its fore

part, constituting the *cervico-dorso-thoracic triangle.*

3. Bandage for Fracture of the Ribs.

Composition.—A single-headed roller ten yards long and three fingers' breadth wide.

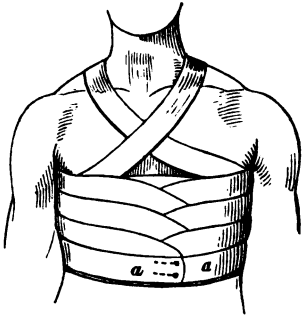
Application.—The initial end is applied to the anterior part of one of the axillæ, which we will suppose to be the left; the head is conducted from hence obliquely upward, in front of the chest, to regain in passing over the right shoulder the point of departure; another and similar turn being effected, the head of the roller, instead of being carried upward, is directed transversely to the right axilla, and two more oblique turns are carried over the left shoulder, which intersect the first behind and in front of the chest; the remainder of the roller is employed in forming transverse doloires from above downwards.

Use.—In fractures of the ribs and sternum, care being taken to apply compresses to the anterior and posterior extremities of the former, if the fragments project inward; but if outward, upon the fractured parts themselves.

4. The Quadriga; or Crossed Bandage of the Thorax.

Composition.—A double-headed roller ten yards long and three fingers' breadth wide.

Application.—The centre of the roller is applied to the sternum; the two heads are carried, one under each axilla, to the back, where they are made to cross; returned from thence to the fore part of the chest, they change hands and are carried obliquely to the shoulders, intersecting each other in the form of X: from the shoulders they are made to descend obliquely behind the back, each to the opposite axilla, and form a second X: they are now brought forward horizontally, and crossed upon the sternum, the upper one being reversed upon the lower, to avoid wrinkles; that done, they are conducted horizontally to the spine, crossed, and returned again to the sternum, where a second reverse is made in a similar way. These turns and reverses are repeated till the chest is covered, and the whole is terminated by one or two plain circles, *a a*, carried about the chest upon the last reverse.



Use.—The same as the preceding.

Observations.—Instead of the above bandages, which are liable to slacken, many surgeons employ a lacing body-bandage.

5. Suspensory for the Breast.

Composition.—A piece of linen, ten inches square, being accurately doubled, two triangular portions are cut away, at the expense of the folded border; the first comprehending one half of the length of this, and the second, the half of what remains; the divided edges are sewed together, and in this manner is obtained a sort of bag capable of receiving the breast. To the lower edge of the bag is stitched a band two yards long and three fingers' breadth wide, and to the upper edge are attached in like manner two bandelettes, each three-quarters of a yard long.

Application.—The diseased breast being engaged in the bag, the lower part of the latter is fixed by two horizontal turns of the band, carried round the trunk, and its upper part, by the bandelettes, conducted over the shoulders, crossed behind the neck, and brought forward under the axilla to the upper part of the breast, where they are to be secured.

Use.—It serves to confine dressings upon the breast, and to sustain it in cases where its weight is productive of pain or inconvenience.

6. Apparatus of M. Recamier for the treatment of Cancerous Tumours of the Breast.

Composition.—Single-headed rollers two and three fingers' breadth wide and eight yards long;—disks

of agaric,* varying from the size of a sixpence to that of a crown-piece.

Application.—Dependent upon the number and the volume of the engorgements. Should the person be young, or one whose breasts are but slightly developed, a few horizontal circulars of the broadest of the above-mentioned rollers usually suffice;† a disk or two of agaric being previously applied to the tumour in order that the bandage may exercise a more perfect compression on the part. When, however, the mammæ are voluminous and soft, it is necessary to give them such a degree of solidity, that the engorged point be incapable of escaping from beneath the compressing body; this is effected by the broad roller, which is made to form a figure of 8 about the breasts; each of the branches will tend to elevate the inferior part of one breast and depress the superior part of the other; a disk of agaric is to be placed upon each of these organs, and confined by a horizontal turn of the narrow roller; other disks are placed over this, diminishing in size, and interposed between each circumvolution of the bandage, until the cone has acquired a sufficient projection.

When the compression is only required to be effected upon one breast, a compressive sling may

* Boletus ignarius.

† A laced body-bandage would answer the same end, and, in truth, of the two would be preferable.

be formed with the broad roller, by directing its head obliquely from the shoulder of the sound side, behind the back and under the diseased breast, and then from below upwards to the same shoulder; a sufficient number of doloires should be thus made to cover the lower half of the breast: the head of the roller being now directed under the axilla of the sound side, a certain number of horizontal doloires are to be effected in order to enclose the breast entirely. The rest of the bandage consists of alternate oblique and horizontal circulars, between each of which is interposed a disk of agaric.

Observations.—The manner of applying this bandage must of course vary according to circumstances, but in every case the compression which is required to be exerted should be equal upon every point of the tumour, and moderately strong. The apparatus should be removed and re-applied once at least every twenty-four hours, in order that its action be constantly the same, a thing of great importance as regards the result of the treatment.

7. Compressive Bandage after Extirpation of a Diseased Breast.

Composition.—A double-headed roller eight or ten yards long, and four fingers' breadth wide.

Application.—The dressings being applied, the centre of the roller is placed under the axilla of the sound side, while the heads are carried ob-

liquely, one before and the other behind the chest, to cover them: after changing hands, they are conducted from thence round the body in such a manner as to engage the remaining breast between the turns, and arrive for the second time upon the dressings. One head of the roller is now employed in making horizontal, and the other oblique turns, the latter passing over the shoulder of the sound side, till the bandage is exhausted.

Observation.—The equal and efficient pressure exerted by this bandage renders it greatly preferable to the body-bandage, when the remaining breast is voluminous.

8. The Strait Jacket.

(Syn. Camisole, Fr.)

The strait jacket is a garment of strong cloth or ticking applied upon persons in furious delirium. This dress extends from the lower part of the neck to a little below the last ribs; it closes behind with tapes sewed upon the borders at intervals of six fingers' breadth, the fore part being a continuation of the cloth; the sleeves are united at their extremities to prevent the patient from using his hands; sometimes they are crossed upon the chest, and tied behind; at other times a cord is fastened to them in front, and fixed to the foot of the bed. A loop is generally fastened to the garment over each shoulder to allow of the passage of a band employed to

maintain the upper part of the body in complete immobility, and in the seam corresponding to the fore-arm is left an opening, through which the medical attendant introduces his hand to investigate the state of the pulse.

9. Body-Bandage of the Abdomen (Lombo-abdominal Oblong), with Thigh-straps.

Composition.—A napkin, or piece of linen of the same form, folded in three, to one of the borders of which are stitched, near the centre, two narrow bands half a yard long to serve for thigh-straps; they should be attached sufficiently apart to correspond with the great trochanters.

Application.—The middle of the napkin is applied upon the loins, the extremities are brought up to the abdomen, upon which they are overlapped and pinned; the bandelettes are then conducted from behind forwards, crossed under the perineum, and fixed upon the fore part of the apparatus.

Use.—To retain a surgical application upon the abdomen, to exert compression on this part after the operation of paracentesis, and to furnish points for the attachment of parts of other apparatus.

10. Posterior Pelvic Triangle.

Application.—Base behind the sacrum; tails tied before the pubes; summit reflected between the

thighs, and attached anteriorly to the circular portion.

Use.—For retaining dressings upon the sacral region.

11. Anterior Pelvic Triangle (for the Male, the Pubio-scroto-lumbar.)

Application.—Base before the pubes; tails tied behind the sacrum; summit carried between the thighs, and attached to the circular portion posteriorly.

Use.—For retaining applications upon the pubic region and genital organs. *See* Bandage, No. 25.

12. Bandage for the Umbilical Hernia of Infants.

Composition.—A morsel of soft rag to apply to the hollow of the navel when the parts are reduced; — a spherical *pelote*, formed from a piece of cork, the size of a marble; or half a nutmeg;—some adhesive plaster;—one or two graduated compresses, and a linen belt about five fingers' breadth wide at the centre, diminishing gradually to the breadth of two fingers at the extremities.

Application.—The pelote is placed over the rag in the hollow of the navel, and confined there by means of the adhesive plaster; upon this the compresses are applied: the whole apparatus is maintained by the belt, which is applied by its middle

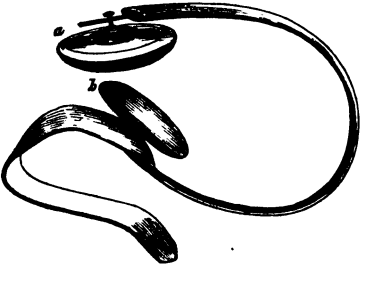
upon the navel, while the extremities are carried round the abdomen, and brought forward and tied in front.

13. WEISS'S IMPROVED TRUSS FOR UMBILICAL HERNIA IN FEMALES.

It consists simply of a pad, *a*, fixed by means of a spring, *b*, in the busk of a stay, *c*: the anterior face of the pad presents a small eminence adapted to the hollow of the navel.

14. SALMON AND ODY'S TRUSS FOR UMBILICAL HERNIA.

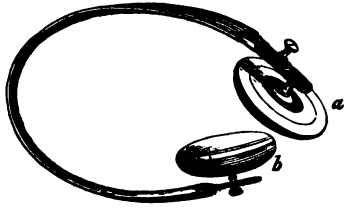
The front cushion of this truss acts upon the ball-and-socket principle; the front and back cushions, *a b*, are connected by a strap, which prevents their displacement. An increased



power of compression is given when required to this and other trusses of Salmon and Ody, by means of a second spring, slided along the outside of the first or main-spring, under the external covering.

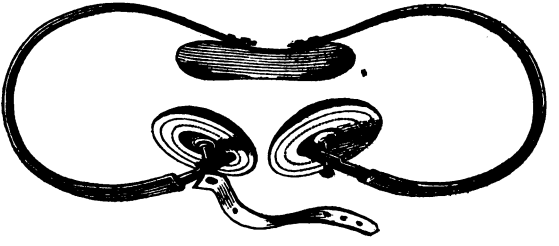
15. Salmon and Ody's Truss for Inguinal or Scrotal Hernia.

This truss is called opposite-sided, from the spring being applied to the opposite side to that on which the complaint is situated: thus, if the complaint is situated in the left groin, the spring is placed on the right hip, and the front cushion, *a*, fig. 1, brought across the median line of the abdomen to be placed upon the affected part; the back cushion rests immediately upon the last dorsal vertebra: should the complaint be at the right groin, the same truss will equally apply, the spring, which moves round the stem of the back cushion, *b*, being brought round the left hip.



The front pad is connected to the spring by means of a ball-and-socket joint, the mobility of which allows it to conform itself to the movements

of the muscles of the abdomen. Fig. 2 represents a double inguinal herniary truss.

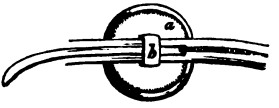


16. ADAMS'S GRADUATED PRESSURE TRUSS FOR INGUINAL HERNIA.

The distinguishing character of this truss, which is made also, when required, upon the ball-and-socket principle, is,.that the pressure may be readily increased or diminished to the necessary extent, without removing it. A groove is made along the centre of the main-spring of the truss, and two rivets, furnished each with a small shield, connect this with a leather strap, and a second and shorter spring, possessing more elastic force, which move along its external face. The extremities of the strap project to some distance through two openings made in the external leather covering of the truss; the anterior extremity is graduated to regulate the pressure; by pulling, therefore, at the posterior extremity, *a*, fig. 1, the compression is in-

creased, and may be again diminished by pulling at the anterior one, *b*.

Fig. 2 represents a moveable pad, *a*, (fig. 1, *c*,) with a loop, *b*, through which the band of the truss passes. The use of this pad is to relieve the pressure of the truss upon the back.



Graduated pressure trusses are made also upon the same principles for femoral and umbilical herniæ.

17. SALMON AND ODY'S TRUSS FOR FEMORAL HERNIA.

The principle of this truss is the same as that of their inguinal and umbilical herniary trusses; it is applied, however, upon the same side as the complaint.

Observations upon Herniary Bandages.—They act in exciting a degree of inflammation, necessary to the obliteration of the mouth of the peritoneal pro-

cess; unless, therefore, as well as entirely preventing the issue of the parts from the abdomen, they exert a due compression, they are useless.

Great attention should be given to the form and consistence of the pad; when this is too convex it is liable, firstly, to press the external soft parts into the opening; secondly, to separate the tendinous fibres near the ring, and thus facilitate a second protrusion; and thirdly, to allow of the passage of the parts from the sides. A pad of too large diameter in inguinal hernia produces an extreme inconvenience from its pressure upon the spermatic chord. So also, when a pad is too soft, it exerts an insufficient pressure, and when too hard, it is liable to injure the soft parts.

A case should be made for the truss of calico or soft linen, which should be changed daily, to protect the truss from the perspiration. An oiled-silk case is perhaps the best of anything.

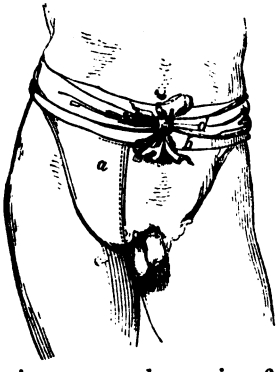
18. Inguinal Bandage.

(Syn. Bandage Triangulaire des Aines, Fr.)

Composition.—One edge of a triangular piece of linen of convenient dimensions is rounded off to correspond to the upper and internal part of the thigh, *a*; to the base of this is sewed a band, *b*, of about a yard and a half in length, and to its summit a bandelette, *c*, two feet long.

Application.—The extremities of the band are carried round the pelvis on either side as far as

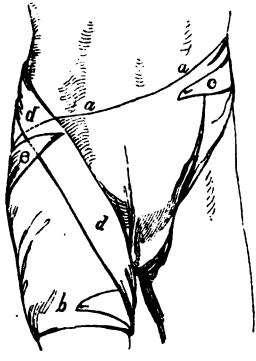
the sacrum, whence they are returned and tied in a bow, *d*, above the pubes, while the bandelette, passing downward between the thigh and scrotum, is attached behind to the transverse portion of the bandage.



Use.—To retain dressings upon the groin of a patient confined in bed.

19. CRURO-ABDOMINAL, OR CRURO-INGUINAL TRIANGLE.

Application.—Place the base, *a*, upward in an oblique direction, extending from the affected groin to just above the iliac bone of the opposite side; bring the inferior tail round the upper and back part of the thigh to *b*, fixing to it in its course the summit of the triangle; to the superior tail attach an end of band, or a cravat, *c*, and conduct this, first round the lumbar region, next obliquely downwards



along the groin, *d d*, and lastly upward and outward along the posterior and superior part of the thigh to terminate in *e*.

Use.—Same as foregoing.

20. Spica for the Groin.

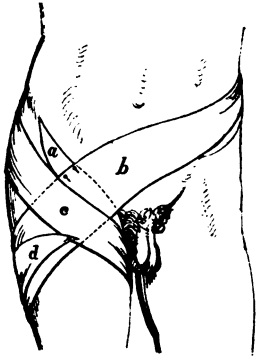
Composition.—A single-headed roller, seven yards long and two fingers' breadth wide.

Application.—The initial extremity is applied upon the sound side of the pelvis, midway between the superior and inferior iliac crests, and is fixed by a couple of horizontal turns carried from before backward. After the second turn of the roller, the head is conducted obliquely downward over the groin of the affected side, and between the thigh and genital organs; winding round the posterior part of the thigh it crosses the groin again, and is made to pass over the pubic region to the point of commencement; a third horizontal turn being effected, the roller is carried obliquely round the thigh, as in the first instance, and then for the fourth time round the pelvis: the course thus described being once or twice more repeated, the bandage is terminated by a circular or two about the pelvis, see page 24.

Use.—To exert compression in venereal ulcers, &c. situated at the groin. It may be used, also, until a truss can be procured for the maintenance of a reduced inguinal hernia.

21. Cruro-inguinal Cravat.

Application.—Place one of the tails, *a*, against the groin and the internal part of the thigh; conduct it round the latter, and bring the middle portion of the cravat over that part of the groin, *b*, upon which the compression is to be exerted, allowing it to cross the end, *a*. From this inguinal region conduct the rest of the cravat, successively, to just above the opposite hip, along the lumbar region, downward and forward, *c*, along the affected groin, and round the posterior and superior part of the thigh to terminate at *d*.



Use.—Same as foregoing.

22. Spica for both Groins.

Composition.—A single-headed roller, ten yards long and two fingers' breadth wide.

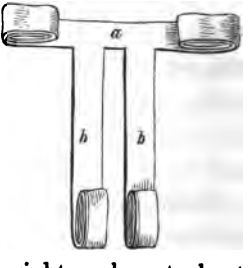
Application.—Two horizontal turns are first made about the pelvis, going, for example, from right to left, and from before backward: upon arriving, at the second turn, near the left groin, the head of the roller is made to pass obliquely downwards along the outer side of the thigh, and ascend along

the inner side to cross the first descending turn; it is next conducted round the pelvis as far as the right groin; passing from hence along the inner side of the thigh, and remounting on the outer side, it is carried again round the pelvis: the head of the roller is made to pursue the track just described, until only a sufficient quantity remain to terminate the bandage by two more horizontal circulars.

Use.—Same, but for both groins.

Observation.—The double action of this bandage may be obtained from the application of two cruro-inguinal cravats. See Bandage, No. 21.

23. Double T Bandage of the Pelvis.



Composition.—A roller, *a*, of sufficient length to pass twice or three times round the pelvis, and three fingers' breadth wide;—two bandelettes, *b b*, each half a yard in length, and an inch in breadth: the bandelettes are stitched to the roller at right angles, at about one-fourth of its entire length.

Application.—The transverse portion of the bandage is glided under the loins, that the vertical bandelettes may correspond to the median line of the posterior face of the pelvis; its extremities

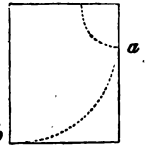
being passed round the body, are fixed with pins; the bandelettes are then brought under the perineum, crossed, and directed upwards and outwards to be fastened to the anterior part of the roller.

Use.—To maintain a dressing or surgical apparatus applied to the perineum, anus, or vagina.

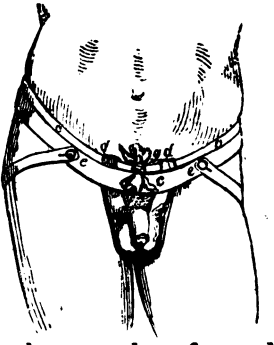
Observations.—It is sometimes necessary to fix a scapulary to this bandage, to prevent it from becoming displaced. It may be replaced by two cravats, a *pelvic* and *sacro-pubic*.

24. Suspensory, or Bag-truss of the Scrotum.

Composition.—The size of the bag can only be determined by the volume of the scrotum, to which it should be proportioned. It is ordinarily made from two pieces of linen or soft drilled duck, six fingers' breadth long and four wide: the pieces being laid together with exactness, two portions are cut out curvilinearly, as shown in the wood-cut by the dotted lines; the divided edges from *a* to *b* being sewed together, a sort of bag is formed, which presents at the middle of its upper part an opening, *f*, through which the penis passes. A belt, *c*, two fingers' breadth wide, and rather longer than is necessary to describe the circle of the body twice, is then sewed along the upper



edges of the bag: to the superior border of this belt, at about two fingers' breadth each way from the centre, are attached two small loops of tape or riband, *d d*, and about as far again from the centre two mould-buttons, *e e*.



Two bandelettes are, in the next place, fastened to the lower angle of the bag, each of about half a yard in length, with two button-holes near their free extremities.

Application.—The penis being engaged in the triangular o[r] *f*, of the bag, and the scrotum perfectly enveloped, the belt is carried round the pelvis, and being returned through the loops, *d d*, tied above the pubes, *g*; the two bandelettes are then made to ascend from the perineum along the inferior borders of the glutei muscles, to be buttoned to the belt in front, *e e*.

Use.—To support and confine dressings upon the scrotum; to serve also for points of attachment to other apparatus. It is chiefly employed in swelled testicle, hydrocele, and irreducible scrotal hernia.

25. COMPOUND PUBIO-SCROTO-LUMBAR TRIANGLE.

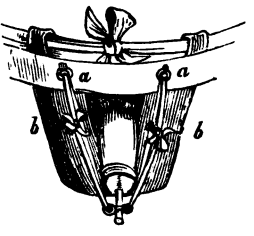
Application.—Form a lombo-abdominal cravat for cincture. Apply the base of a triangle to the under and back part of the scrotum; carry up the tails alongside of this to the fore part of the cincture, about which, pass them from before backward, as represented in the wood-cut, and tie the extremities. Next carry the summit upward, pass it under the transverse portion of the tails and under the cincture, and reflecting it over the fore part of the apparatus, secure it with a pin.

Use.—Same as foregoing.

26. MR. HUNTER'S APPARATUS FOR RETAINING A CATHETER IN THE URETHRA.

Composition.—A bag-truss, with two small rings, *a a*, attached to the fore part, immediately above the ears of the bag;—two small tapes.

Application.—The tapes are fixed by their centre, one to each ring of the catheter; the latter is then introduced into the bladder; after which one of the loose extremities of each tape is passed through



the corresponding ring of the belt, and tied to its fellow in a bow, *b b*.

Observations. — Mr. Hunter sometimes modified the apparatus in the following manner. When the catheter was introduced, he inclined the outer end downwards so as to be nearly in a line with the body; he kept it in this position by means of the belt of a common bag-truss, to which were fastened two thigh-straps: bringing the latter forwards round the thighs and alongside of the scrotum, he fastened their extremities to the belt at the part where the ears of the bag are generally fixed. The straps were each furnished with a small ring, just where they passed the root of the penis, and to these he connected the end of the catheter by a small piece of tape.

27. THE METALLIC RING APPARATUS FOR THE SAME.

Composition.—A metallic ring, the circumference of which is more than sufficient to encircle the penis, is covered with cloth, and to this are attached four long pieces of tape, with the same number of short ones.

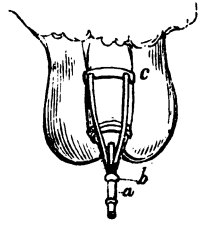
Application.—The ring inclosing the penis is fixed against the pubes by the long pieces of tape, which, surrounding the pelvis in different direc-

tions, meet, and are tied posteriorly. One of the short pieces is carried through the ring or groove of the catheter, on each side, and being tied to its fellow, fixes the instrument securely in the bladder.

28. Elastic-gum, or India-rubber Apparatus of the French Surgeons.

Composition.—Two small strips of this substance are first cut of different lengths, and formed into rings, by means of a few fine silk stitches; one of these should be of sufficient size to adapt itself to the circumference of the penis, and the other to that of the catheter. Four more strips are then cut of the same material, of sufficient length to extend from the middle of the penis to about half an inch beyond the orifice of the urethra, and are attached by their extremities to the two rings.

Application.—The outer end of the catheter, *a*, is engaged in the smallest of the two rings, *b*; the catheter is then introduced into the bladder, while the large ring, *c*, is made to embrace the body of the penis. In order to prevent the catheter from slipping outwards through the ring, the four longitudinal strips are bound to it firmly near the latter, with a bit of waxed thread or silk.



Observations.—This apparatus may be conveniently modified, by employing only one ring and a small piece of narrow riband, thus: the surgeon ties the centre of the riband to the outer end of the bougie or catheter, and introduces the instrument into the urethra; he applies the two bandelettes thus formed along the sides of the penis, and passes over these the gum-elastic ring; reflecting now the bandelettes forward, he fixes them to the extremity of the instrument by a bit of waxed thread. The India-rubber apparatus is preferable to all others, as well on account of its simplicity, as for the perfect manner with which it retains the instrument in the urethra; and not the least advantage of this apparatus is, that its elasticity allows it to accommodate itself to the penis in erection.

29. Apparatus for fixing the Catheter in the Urethra of the Female.

Composition.—A double T bandage;—a piece of tape;—some fine compresses.

Application.—The double T bandage being applied in the manner described, page 100, the surgeon proceeds to fix the centre of the tape to the outer end of the instrument; he then introduces the instrument into the bladder, and attaches the ends of the tape, one on either side, to the vertical tails of the bandage, taking care to place the com-

presses upon the sides of the labiæ externæ, to preserve them from excoriation.

30. Pessaries.

Pessaries are instruments made of ivory, box-wood, or elastic-gum, which are introduced into the vagina, to sustain the parts in cases of prolapsus uteri, prolapsus vaginæ, &c.

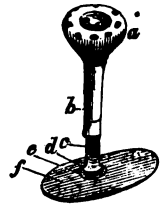
They vary also in form; they are either annular, figs. 1 and 2; oval, fig. 3; in the form of a figure of 8; or on a stem, figs. 4 and 5.

Fig. 1. Fig. 2.

Fig. 3.

The last kind, Mr. Duffin's modification of the *Pessaire à Bilboquet* of the French, is usually made of box-wood and ivory; the head and upper portion of the stem, *a b*, are of box-wood hollowed, the former being slightly concave upon the summit, where it is perforated with small holes.

Fig. 4.

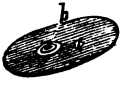


The lower portion of the stem is of ivory, also hollowed; the upper end *c*, of this last portion is turned spirally, in order to screw into the first; while the lower end *d*, is in the form of a ball, which rests loosely in an ivory cup, let into a box-wood shield, *e f*.

The ball-and-socket joint allows the instrument to conform itself to the movements of the body, while the whole receives a steady support, from the shield being confined to the perineum by a T bandage. The screw in the stem of the pessary, allows of the length of the instrument being adapted to that of the vagina.

Fig. 5, represents the under surface of the shield *a*, with the opening of the canal of the pessary externally, *b*.

Fig. 5.



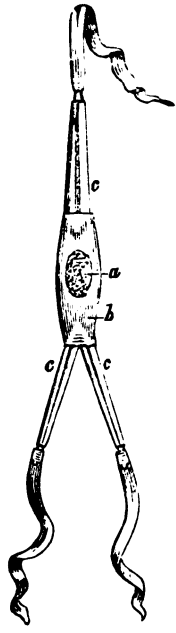
Application of Pessaries.—The bladder and rectum are, first of all, to be evacuated; the woman should then be placed near the edge of the bed, with the pelvis elevated by a pillow, and the thighs put sufficiently apart. The surgeon, having smeared over the pessary with a little pomatum or sweet oil, separates the labiæ externæ with the index and middle finger of the left hand, while with the right he gently introduces it into the vagina. In introducing an annular pessary, he directs it edgewise, and having fairly engaged it within the vagina, he introduces the index finger into its opening, to bring it to a horizontal position.

The oval pessary, fig. 3, is provided with a bit of narrow tape, to allow of its being easily removed.

31. Weiss's Elastic Brace for Prolapsus Ani.

Application.—A belt of webbing is first applied

round the patient's body and buckled in front, and the protruded parts returned into the fundament; the sponge, *a*, (which is sometimes replaced by a smooth convex piece of ivory,) affixed to the central portion of the apparatus, after having been moistened with warm water, is then placed upon the anus; while the straps, *c c c*, are carried upward to be buckled to the belt, the first to its posterior, the two last to its anterior part.



Observations.—This is a most efficient apparatus, but may be replaced upon emergency by the double T bandage, page 100; a piece of moistened sponge and a linen compress being interposed between it and the anus.

SECTION III.

BANDAGES OF THE UPPER EXTREMITIES.

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1. FIGURE OF 8 OF THE SHOULDER AND AXILLA.

Composition. — A single-headed roller seven or eight yards long and three fingers' breadth wide.

Application.—Two circulars are first made round the arm of the affected side, passing from without to within, and from before backward. The head of the roller is then carried behind and above the shoulder, and conducted obliquely downwards before the chest to the axilla of the opposite side, from whence it passes first behind the back, then over the shoulder, to cross the above descending turn and regain the point of departure; several turns of the roller are made in this way, to form a sort of figure of 8, and the whole bandage is terminated by a few circulars round the upper part of the arm.

Use.—To confine dressings applied to the shoulder or to the axilla: it is made to exert compres-

sion in the axillary space, by means of graduated compresses.

2. Axillo-clavicular Cravat.

Application.—Place the centre of the cravat against the axilla of the affected side, and, conducting the tails obliquely upwards before and behind the chest, fasten them upon the opposite clavicle.

Use.—For retaining applications at the axilla.

Observation.—This bandage serves occasionally as a portion of other apparatus: see Humero-scapulary Triangle.

3. Simple Bis-axillary Cravat.

Application.—Place the centre at the axilla of the affected side, cross the tails over the corresponding shoulder, and then carry them one before, the other behind, the chest, to the axilla of the opposite side, where they are to be secured.

Use.—Same as preceding.

4. Compound Bis-axillary Cravat.

Application.—Place the centre of a cravat at the axilla of the sound side, carry the tails obliquely upwards to the base of the neck at the opposite side, and fasten their extremities; next, apply the centre of a second, and smaller cravat, at the axilla of the affected side, and attach its tails to the corresponding portion of the first.

Use.—Same.

5. Figure of 8 for Fracture of the Clavicle.

Composition.—A single-headed roller eight yards long and four fingers' breadth wide.

Application.—The shoulders being held back by an assistant, in order to allow of the fragments of the bone being placed and maintained in contact, the surgeon fixes the initial extremity of the roller, by making a couple of circulars round the upper part of the arm of the affected side; he then carries the head backwards to the opposite shoulder, round which he passes it, to return to the first, which he surrounds in a similar manner; these turns of the roller are applied alternately about each shoulder, and the end pinned, or secured by a few stitches.

Observation.—Employed alone for fracture of the clavicle, it often proves inefficient; but when the elbow is confined against the chest, and, in addition, if need be, a cushion is put under the axilla, it fulfils the indication very well.

6. Simple Bis-axillo-scapulary Cravat.

Application.—Place the centre between the scapulæ, carry one of the tails round the corresponding shoulder and axilla, and fasten the extremity by strong stitches to the body of the cravat; in the next place, conduct the other tail under the corresponding axilla, and over the shoulder, toward the

extremity of the first, upon which it should be similarly secured.

Use.—Same as foregoing.

7. Compound Bis-axillo-scapulary Cravat.

Application.—Knot together the two extremities of a cravat about one of the shoulders, so as to constitute of it a loose ring: next, take a second cravat; apply the centre of this against the anterior face of the other shoulder, and conducting the tails one over the shoulder and the other beneath the axilla,

let the first embrace the corresponding portion of the ring in order that its extremity may be united with that of the second tail, which should be made

previously to pass about the first in the manner represented in the wood-cut.

Use.—Same as the two preceding, but preferable to either, on account of the much greater power it may be made to exert.

8. Dessault's Bandage for Fracture of the Clavicle.

Composition.—Two single-headed rollers, each from seven to eight yards long and three fingers' breadth wide; a wedge-shaped cushion, formed of a piece of soft linen rag, filled with tow or oat-chaff; the cushion should be nearly as long as the humerus, and four or five inches wide at the base; its thickness is usually about two inches and a half, see page 11, fig. *b*;—lastly, a few compresses.

Application.—The fracture being reduced, the cushion is placed, with its base uppermost, under the axilla, and the fore-arm flexed. The surgeon lays hold of the elbow, and carries it forward, upward, and inward, pressing it forcibly against the breast: the arm is now confided to an assistant, who holds it firmly fixed in this position with one hand, while with the other he supports the fore-arm; the ribands fixed to the base of the cushion are carried one before, and the other behind the chest, obliquely upward, and tied upon the opposite shoulder, *c*.

The surgeon, in the next place, taking one of the

rollers, applies its initial extremity under the axilla of the sound side, and fixes it by two horizontal turns about the body, which pass over the upper part of the arm; he then descends with it, in forming doloires, *a*, which should be drawn tighter as they approach the elbow; this is to be entirely surrounded, and the end of the roller pinned.

The compresses, saturated with an appropriate lotion, are now placed upon the fractured bone, and the surgeon applying the initial end of the second roller, also, under the opposite axilla, attaches it to the doloires of the first by a few stitches or a pin; the head of the roller is carried upward, and across the breast, *b*, to the compresses upon the fractured bone; from hence it is brought down behind the shoulder and arm, and being passed under the elbow, *d*,

is conducted obliquely upward, *e*, to the point of departure: it is then carried obliquely upward over the posterior part of the chest to the compresses, and descends along and in front of the arm, *f*, to the elbow, which it embraces; from the

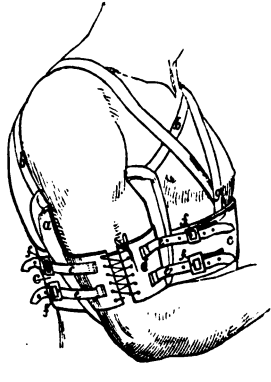
elbow it ascends obliquely upward behind the chest to the axilla, and sets out again, as in the first instance, before the chest, *g*, to traverse the fractured part, the shoulder, the posterior face of the arm, to embrace a third time the elbow, and be returned again before the chest, *h*, to the axilla; lastly, it passes obliquely upward behind the chest to the shoulder of the fractured side, in front of the arm, *i*, under the elbow, behind the chest to the axilla, and is exhausted in horizontal doloires, *k*. A few stitches should be inserted in various parts of the bandage, to prevent the doloires from becoming displaced, and the fore-arm suspended by a sling.

Observations.—The principles upon which this bandage acts, namely, by converting the humerus into a lever, in carrying its lower extremity forward, inward, and upward, pushing the shoulder backward, upward, and outward, render it exceedingly well adapted to fractures of the clavicle. The cushion placed in the axilla serves for the fulcrum. One of its great advantages is, that it may be readily constructed. It is liable, however, to some objections; the compression, for instance, which it exerts about the chest, renders it ill adapted to patients of a delicate constitution, and it requires to be taken off and reapplied at least every two or three days, from the circumstance of its becoming easily displaced by the movements of the patient.

9. Baron Boyer's Bandage for the same.

Composition.—A wedge-shaped cushion for the axilla;—a belt of webbing or of linen quilted, about five inches wide, to surround the trunk, closing at the ends by means of straps and buckles; and a circlet for the arm, constructed of the same materials as the belt, which laces in front. Four straps are attached to the circlet, two on each side, near the uniting edges, while, to correspond with these, four buckles are fastened upon the belt, two before and two behind the arm.

Application.—The cushion, *a*, is placed in the axilla, and the ribands *b b*, carried one before and the other behind the chest to the opposite shoulder, and tied: the belt, *c*, is then passed round the body, beneath the cushion, and a little above the bend of the elbow, and buckled posteriorly.



Next, the circlet, *d*, is laced upon the arm, which is confined to the trunk by means of the straps and buckles, *e e e e*, *f f f f*, of the same; a scapulary, *g*, is sometimes added. While the elbow is thus fixed

firmly to the side, the cushion tends by its resistance to push the superior part of the arm upward and outward. The elbow may be moved either forward or backward by merely tightening the anterior or posterior straps.

Observations.—This bandage, acting upon the same principles as that of Dessault, is preferable to the latter, as well from the circumstance of its not being liable to become displaced, as from inflicting a more limited compression upon the chest; the compression is capable of being regulated by means of the straps and buckles which unite the ends of the belt.

10. Modification of Mr. Earle's Apparatus for the same, by Mr. Chapman.

Composition.—A cushion, *a*, fig. 1, for the axilla, suspended by a cap, *b*, which crosses the shoulder of the affected side;—a long band of webbing, *c*, *d*, *e*, *f*, for supporting the arm, and retaining it in contact with the trunk; the two ends of this band are buckled in front

and behind to a well-padded circlet, *g*, which is slipped over the opposite arm, and rests chiefly on the scapula. The circlet and cap are connected behind by a strap, *h*, buckled to the latter posteriorly, by means of which the shoulders are drawn back to the extent necessary.

Application.—The cushion is first placed in the axilla of the affected side, and fastened to the cap by tapes, and the circlet is then slipped over the opposite arm to the shoulder; in the next place, the patient's hand is passed through the opening, *i*, *a*, figs. 1 and 2, of the band of webbing, which is buckled to the back part of the circlet; the band being then drawn tightly round the waist, the elbow is adapted to the inner fissure, *k*; the elbow is then lodged in the outer fissure, *l*, and the shoulder elevated by buckling the remainder of the band, *f*, to the fore part of the circlet: *b*, fig. 2, represents the elbow lodged in the two fissures. Lastly, the transverse strap, *h*, is buckled to the necessary degree to throw the shoulder back.

Observations.—This bandage unites all the advantages of the bandages of MM. Dessault and

Boyer, while the objections raised against the former for compressing the chest too powerfully, and concealing the fractured parts, and against the latter for not exerting sufficient action upon the shoulders to draw them backward to the necessary extent, in cases of oblique fracture of the clavicle, are done away with. It has, besides, the merit of supporting the fore-arm and wrist in the most perfect manner, and permitting the weight of the injured member to rest in a great measure upon the scapula of the opposite side. It is adapted to fractures of either clavicle by reversing the band of webbing, and transferring the transverse strap, *h*, to the opposite sides of the cap and circlet, to which a second button and buckle, *m*, *n*, are fixed. The band is laced down the middle, *o*, which allows of its being accommodated to persons of different sizes.

11. Bandage for Dislocations of the Clavicle

See bandages for fracture of this bone.

BANDAGES FOR FRACTURES OF THE SCAPULA.

12. For Fracture of the Body of the Bone.

It consists simply of a body or rolled-bandage extending from the shoulder to the elbow, some compresses being placed between the arm and trunk to prevent excoriation of the skin.

13. For Fracture of the Lower Angle.

In this case the fragment is drawn downward and forward by the serratus major anticus; the shoulder, therefore, must be lowered and directed toward the fragment in carrying the arm inward and forward; to maintain it in this situation, it is kept fixed against the trunk by a roller, the fragment being kept back as much as possible by means of compresses. The arm is to be supported in a sling.

14. For Fracture of the Coracoïd Process.

The muscles attached to this process are to be put into a state of relaxation by bringing the arm forward toward the breast, and confining it thus in a sling; the shoulder is to be kept downward and forward, and a compress confined just under the broken part with a roller.

15. For Fracture of the Neck of the Bone.

The head of the os humeri is to be kept outward by means of a thick cushion placed in the axilla, while the glenoïd cavity and the arm are pushed upward with a sling; the arm is then to be confined against the trunk by a roller.

16. For Fracture of the Acromion.

The elbow is to be raised and kept rather back-

ward, with a cushion placed between it and the trunk, in order to relax the deltoïd muscle; at the same time the scapula must be pressed downward to bring the fragments into contact. The bandage proper to maintain the parts in this position consists, first, of several horizontal circulars carried round the arm and trunk; secondly, of a few vertical ones passing round the injured shoulder and the elbow; thirdly, of a number of turns in the form of a figure of 8, the loops of which repose, the highest against the axilla of the sound side, the lowest under the opposite elbow; the intersection should correspond to the superior and internal part of the injured shoulder; fourthly, of some fresh horizontal circulars maintained, together with the other parts of the apparatus, by a body-bandage.

17. HANDKERCHIEF BANDAGE FOR FRACTURES OF THE CLAVICLE, THE ACROMION, AND THE NECK OF THE HUMERUS.

(Syn. Grande echarpe, Fr.)

Composition.—Two large handkerchiefs or pieces of strong linen of the same form;—a cushion for the axilla;—a soft pad for the opposite shoulder.

Application.—First, the cushion, *a*, is to be placed in the axilla, and the arm put into the proper position, with the fore-arm bent; the doubled edge of one of the handkerchiefs, *b*, folded cornerwise, is then made to envelop the elbow, while the corners support the hand; the posterior long ex-

tremity is carried up behind the back to the opposite shoulder, upon which the pad, *c*, is to be previously placed, and the anterior one brought up in front to meet it and be tied.

The second handkerchief, *d*, serves to confine the elbow and forearm more securely by being carried round the waist, and fastened upon the opposite side of the trunk.

Observations.—The bandage should be modified in the following manner when intended for fracture of the acromion: after the first handkerchief is applied, some compresses should be placed upon the injured shoulder, and a few vertical turns of a roller passed round the shoulder and elbow; after which the second handkerchief is to be applied as above; also the cushion under the axilla should be omitted, and a pad placed, before applying the first handkerchief, between the elbow and side.

18. Bandage for Amputation at the Shoulder Joint.

Composition. — A band, eight yards long and three fingers' breadth wide, rolled up into heads

of different sizes, the smallest containing but a yard and a half.

Application.—The surgeon commences by applying the smaller head upon the middle of the operated shoulder, directing the other obliquely before the chest, under the opposite axilla, and then obliquely upward, behind the back, to regain the point of departure, where it passes over and fixes the smaller head; next, directing the latter under the axilla, he passes the former over it to retain it, and, reversing it from behind forward, fixes it with the larger head, which he directs behind and upon the shoulder, across the chest, under the axilla and behind the back to the sound shoulder, upon which he effects a third reverse, which he fixes like the two first. These oblique turns, with the reverses, are repeated in the form of doloires directed from the anterior to the posterior, and from the posterior to the anterior parts of the stump, till the dressings are entirely covered.

19. Humero-scapulary Triangle for the same Operation.

Application.—First apply an axillo-clavicular cravat, the base of which should be placed against the axilla of the sound side, and the extremities fastened upon the clavicle of the side opposite. Then, take a triangle, apply the base below the wound, and conduct the angles to the united portion of the

axillo-clavicular cravat, to which they should be secured.

Observations.—This bandage may be made to serve for amputations of the arm when made near the articulation. It will also be useful, with the following modification, for retaining applications upon the deltoïd, viz. by first applying the axillo-clavicular cravat as above directed; by then placing the base of the triangle against the outer side of the arm, just about the point of insertion of the deltoïd, with the apex directed upwards; passing lastly the tails from without inwards, crossing and returning them to the centre of the base in order to secure them by a knot, or otherwise, and attaching the apex to the united portion of the cravat.

20. Bandage for Dislocation of the Humerus.

It consists of a body or rolled-bandage, extending from the shoulder to the elbow, to confine the arm against the trunk; a few soft compresses should be previously introduced between them, to protect them from excoriation.

21. Bandage for Fracture of the Neck of the Humerus.

Composition.—Two long rollers;—three strong splints, between two and three inches broad;—a cushion, three or four inches thick at one end, terminating at the other in a narrow point, and long enough to reach from the axilla to the elbow;

—a sling to support the fore-arm;—lastly, a towel to cover the whole apparatus.

Application.—The fracture being reduced, and maintained by the assistants, the surgeon fixes the initial extremity of one of the rollers, which has been previously saturated with a lotion, at the upper part of the fore-arm by two or three circulars, and winds it round the arm in doloires; taking care, however, when he arrives at the upper part of the limb, to make reverses, in order to prevent folds to which the inequality of the part would otherwise give rise; from hence he carries the head of the roller twice round the opposite axilla, and confides it to one of the assistants, who retains it upon the top of the shoulder of the injured side. The first splint being placed in front, reaching from the bend of the arm as high as the acromion; the second, on the outside, from the external condyle to the same height; and the third, from the olecranon behind to the margin of the axilla: they are given to another assistant to hold; which he does by applying his hands near the bend of the arm, in order not to obstruct the application of the bandage.

The surgeon now takes the roller, and descends by moderately tight doloires to the upper part of the fore-arm, where he pins the end, and while the assistants still keep up the extension, he places the pillow between the arm and trunk, taking care to put the thick end upward, if the fracture be dis-

placed inward; but downward, if this should be displaced outward; which is most commonly the case; fixing it with pins to the upper part of the roller: lastly, bringing the arm against the trunk, he confines it there, by means of the second roller, applied in horizontal circulars. The turns of the last roller should be rather tight below and slack above, if the fracture be displaced inward; but if outward, they should be slack below and tight above. The fore-arm is to be sustained by a sling, and the whole apparatus enveloped in the towel to prevent any displacement of the bandages.

Richerand employs in his practice, instead of the above bandage, which is very inconvenient to the patient, a sling made with a towel, which embraces at once the arm, fore-arm, and shoulder, and presses the arm strongly against the thorax. See Handkerchief-Bandage, page 122.

22. Bandage for Fracture of the Body of the Humerus.

Composition.—A single-headed roller eight or nine yards long and three fingers' breadth wide;—a longitudinal compress made of soft linen rag;—four splints, not quite so long as the arm, nor so broad as to touch each other when applied;—lastly, some lint or charpie.

Application.—The surgeon, placing himself on the outer side of the limb, commences by passing a

roller, carefully, round the hand and fore-arm, to prevent œdema of those parts; fixing its initial end by a few circulars made above the fingers, and having filled the hollow of the hand with cotton, carrying the head of the roller upward to the elbow in the form of doloires. His next care is to reduce the fracture; and being well assured that the arm has resumed its natural form and length, he continues the turns of the roller onward to the upper part of the limb, applying the compress, however, previously saturated with a lotion, over the fracture, and filling up with cotton or some other soft material the depression which corresponds to the insertion of the deltoïd muscle, in order to effect a uniform pressure. That done, he confides the head of the roller to an assistant, and places the splints, well padded, along the arm, at the extremities of its transverse and antero-posterior diameters. Lastly, the assistant giving up the roller to the surgeon, and laying hold of the splints near the bend of the elbow, the latter proceeds to cover them from above downward, by spiral turns, and fastens the end of the bandage with a pin.

Observation.—This is all that is necessary to be done when the patient keeps his bed; should he desire to walk about, the fore-arm is to be bent upon the chest, and fixed, together with the whole apparatus, by means of a sling.

23. Bandage for Amputation of the Humerus.

Composition.—A roller six yards long and three fingers' breadth wide;—lint or charpie, and a compress, (*the Maltese cross.*)

Application.—The operation being ended, and the vessels tied, the surgeon brings together the edges of the wound, and retains them thus by means of slips of adhesive plaster, allowing, however, the ligatures to hang out from the posterior angle of the wound; over these strips he places the lint, or a *plumasseau* of charpie, which he confines by the Maltese cross; he then applies the initial extremity of the roller under the axilla of the opposite side, and brings its head forward upon the shoulder of the amputated limb, round which he passes it, to return to the point of commencement over the posterior part of the thorax; this course is to be pursued a second time to form a spica, and the remainder of the roller employed in forming doloires, which should descend along the arm to cover the applications.

24. Triangle-cap:—for the Humerus and all other Amputations.

Application.—The base of a triangle is to be conveniently placed under the limb, and at a convenient distance from the extremity of the stump; the tails are then to be brought forward and over-

lapped, and the summit reflected upward toward the circular portion, to which it is to be secured. In this last part of the process care should be taken that the linen embrace in the most perfect manner the extremity of the stump.

Or, instead of commencing with the lateral angles, the summit may be first carried upward in the manner described, and then the tails in encircling the limb may be made to include its extremity.

Observations. — Whether employed in amputations of the upper or lower limbs, of the fingers or toes, or even of the penis, nothing can be more simple or more effectual than this bandage. In general, no further precaution is necessary than to insist upon the patient remaining quiet; for if the apparatus be carefully applied, there will be hardly a possibility of any derangement. But should it be absolutely necessary to have recourse to some expedient to prevent the apparatus from becoming detached, a cravat belt may be applied about the neck, or pelvis, the lower part of the arm or thigh, the wrist, or ankle, according to the seat of the operation, and to one or other of these belts the apparatus may be connected by means of a tape, riband, or bit of band.

25. Bandage for Fracture of the Lower Extremity of the Humerus.

Composition.—A single-headed roller four or five yards long;—two pasteboard splints to be applied

when the arm is bent at right angles, one upon the side of flexion, and the other upon that of extension;—each of the splints, previously softened with vinegar or water, should be divided to about one-fourth of the entire breadth on either side, the outer one at the part corresponding to the elbow, and the inner one at the bend of the arm.

Application.—The surgeon first surrounds the fore-arm and arm with a portion of the roller, and confides the head to an assistant; flexing the fore-arm at right angles upon the arm, he applies the splints, and adapts them accurately to the bend of the elbow: the assistant then resigns the head of the roller to the surgeon, and lays hold of the splints to keep them in place, while the latter proceeds to cover them from above downward with the remainder of the bandage. The fore-arm should be maintained in the bent position by means of a sling.

26. Sling for the Fore-arm.

(Syn. Moyenne écharpe, Fr.)

Composition.—A napkin or square handkerchief folded triangularly.

Application.—The handkerchief thus folded is passed between the patient's arm and chest, the doubled edge corresponding to the wrist, and the corners to the elbow, *a*: the ends are then carried

upward, the anterior one, *b*, on the side opposite to the affected limb, and the posterior one, *c*, on that corresponding to the injury, to be tied in a knot or bow, *d*, behind the neck.

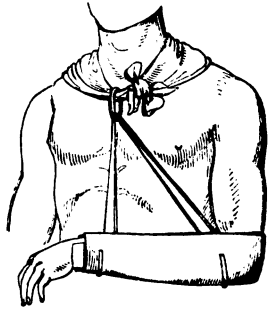
Observation. — This bandage, used in fractures, &c. of the upper extremities to support the fore-arm, is preferable to the handkerchief bandage in all cases where it is not deemed necessary to keep the arm fixed in a state of immobility against the chest.

27. Ante-brachial Trough.

Composition.—It may be either constructed of leather or pasteboard, which latter may be covered with some appropriate material in the view of preserving its form, and even giving it a sort of embellishment; it may be either straight, that is to say, open at the level of the elbow, or, as represented in the wood-cut, terminating thereat in a cul de sac:—a long riband or cord is required to serve for its suspension, and constitute two collateral bows, to which the author applies the term of *arc-loops;*—lastly, a cravat.

Application.—The cravat is made to constitute

the CERVICAL CRAVAT. Four holes being previously bored through the trough, at convenient distances apart, near its borders, the cord is run through in order to form the *arc-loops*, which, in their passage, should be made either to glide through the Cervical Cravat, or, what is better, through a ring, as represented in the wood-cut, which serves to connect them, and allows of a free play of the loops, from which the patient will derive no small convenience. When the apparatus is thus prepared, nothing remains to be done but to introduce therein the patient's fore-arm, which has been, if fractured, previously furnished with its bandage.



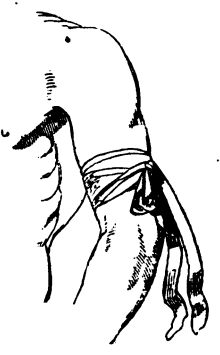
Observations. — This apparatus may be worn enclosed in the patient's ordinary dress, so as not to give the least appearance of the arm being subjected to confinement. If, however, it be required to preserve the elbow fixed against the trunk, a riband may be made to pass through a couple of holes perforated in the internal portion of the trough, or that which corresponds to the body, and to embrace the trunk as a cincture or body-bandage. If it be necessary to give support to the hand or wrist, a thin flat piece

of wood may be laid at the bottom of the trough, and its projection beyond the edge of the latter regulated according to circumstances.

28. Bandage for Phlebotomy.

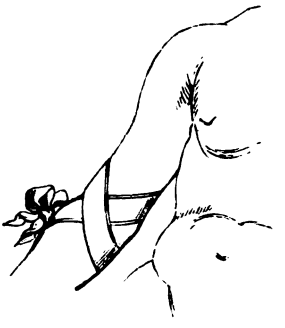
Composition.—A ligature, to be applied to the arm just above the elbow;—a roller two yards long and two fingers' breadth wide;—and a compress or pledget of soft linen rag.

Application.—In commencing the operation, the surgeon places the arm in a state of supination, and applies a ligature at the distance of three fingers' breadth above the elbow, which he ties on the outside of the arm in a single bow; the ligature should have sufficient tightness to intercept the passage of blood through the superficial veins, but not through the arteries, which would prevent the veins from becoming turgid.



The bleeding ended, the surgeon takes off the ligature, and, after wiping the arm, applies a compress over the orifice of the vein; then, placing the initial extremity of the roller upon the upper and outer part of the forearm, he carries the head obliquely upward (passing over the compress) above the internal tuberosity of

the humerus, then along the posterior part of the arm above the olecranon to the internal tuberosity, whence he conducts it obliquely downward, passing again over the compress to carry it round the fore-arm to the point of departure: the turns just described are repeated three or four times more, and the end of the bandage fastened with a pin.



An unrolled band is usually substituted for the one just described, in the form also of a figure of 8, the ends being tied in a bow as represented in the cut.

Observation.—The cravat may be used in this operation for tying up the arm, should the practitioner be in want of a common ligature and compresses. Thus, the cravat should be *loosely knotted* in the centre, and by being applied in the form of a figure of 8, with the knotted portion over the wound, the combined effects of the two will at once be produced.

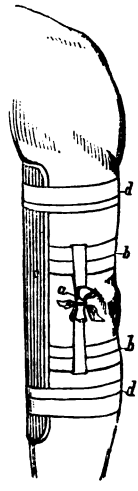
If it be required to exert strong compression about a limb in a case of hemorrhage when no tourniquet is at hand, an excellent substitute may be found in the cravat, which should be *tightly knotted*

in the centre. The knotted portion being then applied to the limb along the course of the vessel and above the seat of hemorrhage, the tails should be carried to the opposite side and crossed; from thence they should be re-conducted to the knot, which here replaces the *pelote*, and an incision having been previously made at a convenient distance from the extremity of one, the other tail should be made to pass through this incision, and the two extremities forcibly pulled in contrary directions, laid down, and firmly pinned or stitched.

BANDAGES FOR FRACTURE OF THE OLECRANON.

29. Sir Astley Cooper's.

Composition.—Two strips of linen, each about half a yard long;—two small rollers;—a roller of a larger size;—and a split deal splint, of a sufficient length to extend from the margin of the axilla to about half way down the fore-arm.

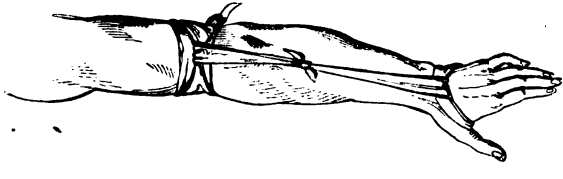


Application.—The patient's arm is to be put into extension, and the fragment pressed down until it touches the ulna; a strip of linen is next to be applied upon each side of the joint, and one of the small rollers passed round the limb above, and the other below the olecranon,

to secure them, *b b*. The extremities of each slip being reflected and tied together, *a*, the rollers are drawn nearer to each other, and the fragment of the olecranon kept in the closest apposition possible with the ulna. Lastly, the split deal splint, *c*, well padded, is applied along the front of the arm, and secured with a bandage, *d d*, which is to be frequently wetted with an evaporating lotion.

30. Olecrano-metacarpal Cravat.

Application.—After having applied a strong pasteboard splint, moulded, while wet, to the form of the inside of the arm corresponding to its flexure, pass around the lower part of the humerus a cravat-belt, leaving an extremity of about six inches; this cravat-belt will firmly embrace the splint. Then,



pass a second cravat-belt about the hand, which the thumb will prevent from slipping upwards, leaving also an extremity of equal length with the first. When this is done, the two loose extremities have only to be knotted as represented in the wood-cut, or otherwise secured, and flexion of the arm will be rendered impracticable.

31. M. Dessault's.

Composition.—A strong pasteboard splint, long enough to cover a part of the arm and fore-arm, and shaped so as to accommodate itself to the bend of the elbow, when the arm is in a demiflexed position;—a roller five or six yards long and three fingers' breadth wide;—and some compresses or lint.

Application.—The limb being maintained by two assistants in demiflexion, the surgeon proceeds to cover the hand and fore-arm with the roller; as he approaches the elbow an assistant draws the skin, which is here usually wrinkled, gently upward, to prevent it from introducing itself between the fragments: the surgeon now pushes down the fractured extremity of the olecranon, in order to place it in exact contact with the ulna, and confines it in this situation, by means of a few turns of the roller, carried round the joint in form of a figure of 8, as in the bandage for phlebotomy: the elbow being at length covered, he carries the roller spirally as far as the axilla, and applies the curved splint well padded with the lint or compresses along the front of the arm and fore-arm, fixing it by a succession of oblique turns of the remainder of the roller, carried down to the wrist.

Observation.—This bandage will serve equally well for dislocation of the upper end of the ulna, when it accompanies fracture of the olecranon.

32. Bandage for Fracture of the Radius and Ulna.

Preliminary Remarks.—When there is fracture of both bones, the patient is placed in a sitting posture, and the surgeon bends the arm and fore-arm, and places the hand in a middle state between pronation and supination. An assistant now lays hold of the hand and extends the fractured parts, while a second effects counter-extension, by fixing the humerus with his two hands just above the elbow. The surgeon restores the bones to their natural situation by applying the extremities of the four fingers of each hand upon the palmar face of the fore-arm, opposite the interosseous space, and, by a gentle pressure exerted on both sides, pushes the soft parts into the interval, and effectually separates the fragments of the radius from those of the ulna.

In cases where one alone of the two bones is fractured, the extension required is but trifling; when it is the radius, the patient's hand should be inclined toward the cubital side of the member; and when the ulna, to the radial; in either case, pressure is to be exerted upon the muscles of the interosseous space to keep the bones sufficiently apart.

The following bandage will be found suitable for fractures of one, or both bones.

Composition.—A single-headed roller six yards

long and three fingers' breadth wide;—two graduated longitudinal compresses nearly as long as the bones of the fore-arm, the thickness of which should be proportioned to the arm in such a way, that, when applied along its anterior and posterior sides, the extent of the antero-posterior diameter of the whole should be rather more considerable than that of the transverse;—lastly, two splints, one of which should be of sufficient length to extend from the bend of the elbow to the palm of the hand, and the other from the olecranon to the dorsal face of the metacarpus.

Application.—For fracture of both bones.—The compresses, saturated with an appropriate lotion, are first to be placed upon the dorsal and palmar face of the fore-arm, and over these, the splints, lined with compresses, wetted like the preceding; the splints are to be fixed by means of the roller, the turns of which should be particularly close, and should envelop the hand. The fore-arm is to be supported in a state of demiflexion, and between pronation and supination, by means of a sling.

For fracture of one alone of these bones.—Whichever be the injured bone, the application of the bandage differs only from the one described above, by the head of the roller being carried from without to within, or from within outward, according as it may be found requisite, to maintain the hand in a state of adduction or of abduction.

Observation.—In double fractures of the fore-arm, the best apparatus is perhaps that of Scultetus; see its description, sect. 4.

33. Mr. Amesbury's Splints and Bandage for Fractures of the Fore-arm below the Olecranon.

Composition.—A narrow split deal splint of sufficient length to reach from the elbow to the tips of the fingers;—Mr. Amesbury's two convex splints;—cushions for the three;—lastly, a small band.

Application.—The arm is to be raised by an assistant, and turned so as to bring the bones in a proper line, and the hand in a position nearly supine. The surgeon then applies the long convex splint, *a*, fig. 1, upon the back of the fore-arm, with its most convex part opposite the space between the ulna and radius. The short convex splint, *a*, fig. 2, should be also placed in such a manner that the middle of its convexity

Fig. 1.

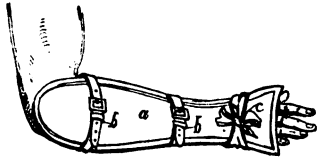
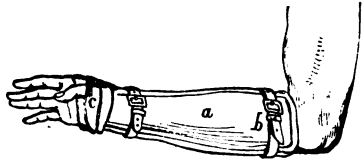


Fig. 2.



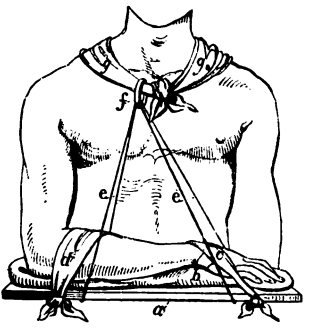
be opposite the middle of the fore-arm. The assistant then holding these splints firmly upon the arm, the surgeon proceeds to place the deal splint along the line of the ulna. The straps, *b b*, *b b*, figs. 1 and 2, fixed upon the convex splints, are then to be buckled round the limb, in order to secure the splints and produce a moderate degree of pressure. The hand is to be secured to the back splint by the band, *c c*, figs. 1 and 2, and the arm placed in a sling.

Observations.—During the union of the fracture, the straps are to be buckled a little tighter in proportion as the tumefaction subsides, and the soft parts yield to the pressure. Great care, says Mr. Amesbury, should be taken to make the sling press equally, or as much at the elbow as at any other part; and it should be left long enough to allow the fore-arm to hang at a right angle with the humerus.

34. Ante-brachial Hyponarthecia.

Composition.—A board of convenient width, a little longer than the fore-arm and hand; — a cushion; — a cord for arc-loops; — and three cravats.

Application.—The fracture being reduced, the fore-arm is made to repose on the cushioned board, *a b*, which is immediately put into suspension to the patient's neck by means of the arc-loops, *e e*



ring, *f*, and CERVICAL CRAVAT, *g*. The second cravat, *c*, is now passed under the wrist and crossed upon the back of the hand, the tails being then made to embrace the cushioned board, and knotted at its anterior border, as represented in the wood-cut. That done, the third cravat, *d*, is made to pass round the apparatus at its upper part, so as to confine the corresponding portion of the fore-arm and be knotted also at its anterior border. Should it be deemed expedient, a fourth cravat may be made use of, to serve for a *traction-ligature*, which will of course be knotted at the inner border of the suspension-board. See principles of Hyponarthecia and use of traction ligatures, page 46.

Observations.—It will here be seen what immense utility may be derived from the hyponarthecic apparatus; for in cases of fracture complicated with laceration, or other injuries of the soft parts, even occurring at the upper extremities, the wounds remain under the constant inspection of the practitioner, and are not subjected to the incommodious and even dangerous pressure of the common bandage, which must be the case when

recourse is had to it under such circumstances. The patient may even be permitted, by the employment of this apparatus, to take exercise, when the injuries of the soft parts are not very grave; but if, on the contrary, perfect repose be deemed essentially necessary, instead of the above apparatus, a board should be procured, which, extending from the axilla to beyond the fingers' ends, should be well cushioned, and maintained in place by means of a BIS-AXILLO-SCAPULARY CRAVAT. The board may then be put into suspension. The above cravat may be adapted to suit the object in view in the following manner:—The centre of the cravat should be applied to the axilla of the sound side, its tails carried before and behind the chest to the opposite shoulder, crossed thereon, and then brought down, one on each side of the deltoïd, to the upper part of the board, the extremities being made to pass through a mortise perforated in each border, in order to be knotted underneath.

The ligatures of fixation, and the traction-ligatures, may then be adapted according to the principles of the system.

With respect to the suspension, in such a case it may be made either from the ceiling, or the top of an ordinary bed; or if the hospital bed be employed, as described in the Appendix, from the *suspension-bar* attached thereto. A precaution perhaps not unnecessary to be given, with regard to

the cushion, is, that this should be of sufficient length to allow of its being turned downwards at its upper part, in order to protect the axilla from the pressure of the extremity of the board.

This last apparatus will of course be equally applicable to fractures of the humerus, if complicated with severe injuries of the soft parts.

35. BANDAGE FOR AMPUTATION OF THE FORE-ARM.

Composition.—A single-headed roller four yards long and three fingers' breadth wide;—lint or charpie;—some slips of adhesive plaster;—and a longitudinal compress.

Application.—When the vessels are tied, the flesh and integuments are to be brought together from before backward, and from behind forward, over the extremities of the bones; the ligatures ought to be placed at the angles of the wound, and the edges of the latter maintained in apposition by means of the strapping. Over the extremity of the stump is then placed a pledget of lint or charpie, smeared with spermaceti ointment; another and dry pledget upon this; and, lastly, a longitudinal compress. The whole of the dressing is to be confined by the roller, the initial end of which is to be placed upon the lower end of the arm, and fixed by a circular or two; the head of the roller is then to be carried about the bend of the elbow as in venesection, and continued onward to the verge of the wound. See Triangle-cap, 24 of this section.

BANDAGES FOR DISLOCATIONS OF THE UPPER EXTREMITIES OF THE RADIUS AND ULNA.

36. For Dislocation of the Humero-cubital Articulation.

Composition.—A single-headed roller of moderate size, and some lint or compresses.

Application. — The articulation is to be surrounded with the compresses saturated with cold water, and maintained by means of the roller applied rather tightly in the form of a figure of 8. The limb is to be supported in a due degree of flexion by means of a sling.

37. For Dislocation backward of the upper end of the Radius.

Composition.—A longitudinal compress;—a single-headed roller four or five yards long;—and a strong pasteboard splint, previously wetted and shaped to the inside of the arm, reaching from the lower third of the humerus to the palm of the hand.

Application. — The patient's hand being held, after the reduction, in the state of supination, the compress is to be placed along the palmar face of the joint, and maintained there by means of the roller, which should extend from the hand to above the elbow, passing round the latter in the form of

a figure of 8; the splint, properly padded, is to be applied over these, and fixed by spiral turns, conducted from above downward, of the remainder of the roller.

38. For Dislocation forward of the upper end of the Radius.

Composition.—A roller four or five yards long.

Application.—It should be applied from the hand to the lower part of the humerus; the limb is then to be bent at right angles, and the fore-arm and hand supported in a middle state, between pronation and supination, by means of a sling.

39. Bandage for Dislocation of the lower extremities of the Radius and Ulna, or Dislocation of the Wrist.

Composition.—A single-headed roller four or five yards long;—four longitudinal compresses;—four splints; two of these should be rather longer than the others, and extend before and behind the limb to the phalango-metacarpal articulation; — the splints should be about an inch and a half broad.

Application.—When the reduction is effected, a few turns of the roller are to be applied about the hand, and the compresses placed forthwith upon the anterior and posterior faces, and upon the sides of the fore-arm; these are to be covered by the four splints, and the whole maintained by the remainder of the roller, which should be carried up-

ward spirally, and form an 8 about the elbow; the fore-arm ought then to be supported in a sling.

40. Another Bandage for the same.

Composition.—A roller four yards long and two fingers' breadth wide;—one or two longitudinal compresses;—and, lastly, a palette or hand splint.

Application.—When the dislocation is reduced, the joint is to be surrounded with the compresses, wetted with a cold lotion; the surgeon then applying the initial end of the roller upon the lower part of the fore-arm, fixes it by a few circulars, and descends with it by doloires to the wrist; hence he directs the head obliquely over the back of the hand, and passing it between the thumb and index finger and across the palm, returns it to the dislocated part; when the roller has pursued twice or thrice more the course just described, about the hand and wrist, these last are to be placed upon the palette, well cushioned with lint, and secured to it by the remainder of the roller.

Observation.—When the os magnum is displaced, the apparatus requires the addition of a graduated compress and small splint to be placed over the reduced bone.

41. Sling for the Hand or Wrist.

Composition.—A piece of linen or silk half a yard long and a quarter of a yard wide, folded crosswise

at the middle. The extremities are to be plaited, and a riband attached to each.

Application.—The hand and wrist are to be engaged in the middle portion of the sling, and the ribands brought upward to be tied to a button of the patient's coat, or fastened in any other convenient way to the dress.

42. Carpo-digito-dorsal Triangle.

Application. — Place the base of the triangle against the dorsal surface of the wrist; carry the tails round this, overlap the extremities and pin them; the summit, which has been extended beyond, must now be reflected underneath the fingers, in curving these sufficiently, that it may be firmly stitched to the palmar face of the circular portion of the bandage.

Use.—In transverse wounds of the palmar face of the hand or fingers. Also in burns of the dorsal face of same, to prevent unsightly cicatrization.

43. Palmo-digito-brachial Triangle.

Application.—A ligature being previously placed upon the lower part of the arm, just above the condyles of the humerus, with an end left unattached, the base of a triangle is to be applied against the palmar surface of the wrist, around which its tails are to be carried, and their extremities overlapped and pinned. The summit, which has been ex-

tended over the palmar face of the hand and fingers, must now be reflected upwards, in forcing the extension of the latter, and united to the pendent extremity of the supra-olecranian ligature.

Use.—In transverse wounds of the dorsal face of the hand and fingers, or in burns of the palmar face of same.

Observations.—This bandage, like the preceding, is simply the TRIANGLE-CAP, 24, of this section.

44. BANDAGE FOR DISLOCATION OF THE METACARPAL BONES OR THE PHALANGES.

Composition and Application.—Narrow longitudinal compresses of sufficient thickness are applied upon the dorsal and palmar faces of the metacarpal bone and the corresponding finger, together with two long splints; and the whole maintained in place by a narrow roller.

45. SPICA FOR THE THUMB.

Composition.—A roller three yards long and a finger's breadth wide.

Application.—The initial end is fixed upon the wrist by two or three circulars; after the last turn, which should be terminated upon its radial side, the head of the roller is to be directed from the external to the internal side of the thumb, passing between this and the index finger, to return and cross its base, and be carried onward again about the wrist: these double circulars are repeated, to

form a spica, till the whole of the bandage is exhausted.

Use.—Principally in dislocation of the first metacarpal bone. It may be used also for either of the fingers.

Observation.—This bandage may be conveniently replaced by the common oblong.

46. Gauntlet.

Composition.—A single-headed roller eight yards long and an inch wide.

Application.—The initial end is fixed upon the wrist by two circulars; the head is then directed obliquely from the cubital side of the same, across the back of the hand, to the space between the thumb and index, in order to embrace, by doloires, the whole of the latter, from without to within, beginning at its lower part: having arrived at the end of the finger, it is conducted downward, in two or three turns, to the back of the hand, and from thence to the wrist, around which another circular is passed: the other fingers are covered in the same manner, and the bandage is completed by a few circulars about the wrist.

Use.—In fractures and dislocations of the phalanges; in burns, to prevent the fingers from uniting; in diseases also of the carpus and metacarpus. It may be made, but less solidly, with a roller for each finger.

47. Demi-gauntlet.

Composition.—A roller four or five yards long and an inch wide.

Application. — It is fixed, like the preceding, about the wrist; it is then carried obliquely to the base of the index, which it embraces, and is reconducted diagonally to the wrist, which it again encircles. Having embraced successively, and in the same manner, the base of each finger, it is terminated by a few circulars about the wrist.

Use.—In dislocations of the first phalanx, with the metacarpal bones, and in diseases which have their seat upon the back of the hand.

Observation.—This bandage may be commodiously replaced by the Triangle-cap described at No. 24 of this section, holes being perforated for the passage of the fingers.

SECTION IV.

BANDAGES OF THE LOWER EXTREMITIES.

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1. Baron Boyer's Apparatus for Fracture of the Neck of the Femur.

Composition.—A splint of particular construction for extending the limb;—a foot-support;—a kind of padded belt, which is buckled round the upper part of the thigh;—two common flat splints of the length of the limb, one for the anterior and the other for the internal part of the thigh;—and some cushions, tapes, and wadding.

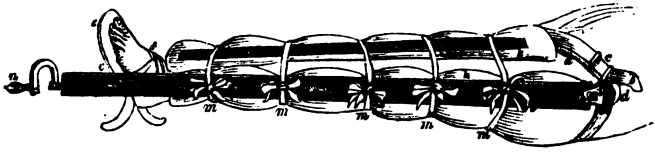
The splint is about four feet long and three fingers' breadth wide. Along half the length of this splint runs a groove, about half an inch broad, the extremity of which is covered with iron; to this groove a screw is adapted, which occupies its whole length, one end of it being supported against the plate of iron covering the extremity of the groove, and the other made to fit a key by means of which it is to be turned. On the inside of this splint a

contrivance for holding up the foot-support is fastened to the screw. The upper part of the splint is received in a sort of pouch or bag adapted to the external side of the thigh-belt. The sole or foot-support, which has two branches at its inferior part, is made of iron, and covered with soft leather. It is connected by means of a mechanical contrivance, as just mentioned, with the screw. To that part of the sole which is near the heel, is attached a broad piece of soft leather, which being split on each side into two straps, serves for fixing the sole to the foot.

The thigh-belt is of strong leather, covered with the same material of a softer quality, and well stuffed with wool: near the place where its two ends are buckled together on the limb, a little leather pocket is sewed for receiving the upper end of the external splint.

Application. — The patient being properly disposed upon the bed, a piece of linen of the length of the limb and about three-quarters of a yard broad, called *porte-attelle*, or splint-wrapper, is passed under the limb, lying upon the five ordinary tapes, *m m m m m*. In the next place, the thigh-belt is applied, the surgeon having previously surrounded the upper part of the limb obliquely with a cushion of wadding, four fingers' breadth wide, and the length of the thigh-belt, in order to moderate the pressure of the latter, and render it

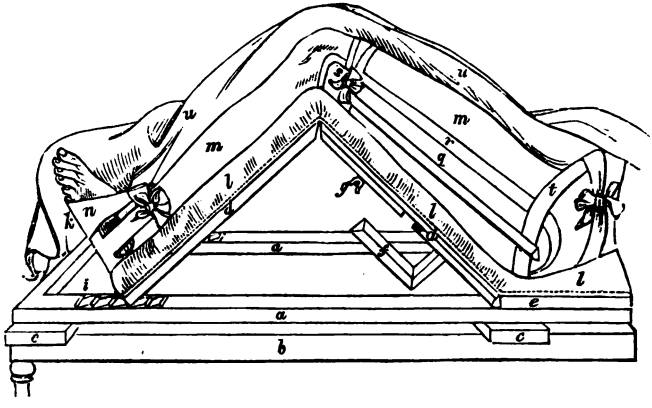
more supportable, *a a*, *b*, *c*, *d*. The hollows of the sole of the foot and lower part of the leg are filled up with wadding or tow, and the foot-support, *e*, is



fastened to the former by means of the soft leather straps attached to its under surface, which pass round the lower part of the leg: should, however, these straps appear insufficient to fix the iron sole to the foot firmly, an extra band, *f*, may be applied in the same manner, of calico or linen.

That done, the surgeon proceeds to the reduction of the fracture, and afterwards adapts the upper extremity of the splint to the pouch of the thigh-belt, *g*, *h*, *i*; the foot-support being connected with the splint, the cushions, and the anterior, *k*; and internal splints are to be applied, and the whole fixed by means of the tapes, as in the ordinary bandages for fractures of the thigh. Lastly, by turning the winch, *n*, the iron sole is lowered, drawing the foot, to which it is attached, along with it; the superior extremity of the splint is thus pushed upward, and the member elongated to the necessary extent.

2. Mr. Amesbury's Apparatus for Fractures of the Upper Part of the Femur.



Composition.—Three pieces of board are to be procured of sufficient length to rest upon the sides of the bedstead *b*, by which the apparatus itself is to be raised from the floor. One of these, *c c*, should be placed near the lower end of the frame, *a a;* the second near the lower end of the upper plane, *e;* and the third near the upper end of the frame. The middle and lower planes, *d d*, being raised to the proper degree of elevation, rest upon the rack, *i*, of the frame, and are covered by a hair mattress, which should extend the whole length also of the plane, *e*, as they lie connected together. The mattress should be provided with a hole at the part which corresponds to the middle plane of

the apparatus. A blanket and sheet, with a hole in each, to correspond to the hole in the mattress, are to be applied over this, and stitched round the edge, *l l l*, and round the hole in the centre, placed opposite the trap-door, *f*, in order to prevent them from getting into folds and incommoding the patient.

Application.—The patient is to be placed upon the mattress with the perineum opposite the hole in the middle plane of the apparatus; and the lower limbs, *m m*, over the double inclined plane. The foot of the injured limb should then be fixed by means of a band, *n*, and a pad placed just below the external malleolus, to the foot-board, *k*, which will keep it upright, with the heel close down against the mattress. After which the middle plane, *d*, should be adapted to the length of the sound thigh, by the two portions of board of which it is composed being moved upon each other so as to elongate or shorten it as it may be found necessary: it is fixed by the screw, *g*. The pelvis and limb may be thus kept perfectly quiet, and motion of the fragments totally prevented; continued extension may be made in the line of the thigh-bone and retraction of the limb prevented, while neither inversion nor eversion of the foot can possibly take place. When the *neck* of the thigh-bone is fractured, there are two indications to be fulfilled; namely, to prevent the upper end of the

femur from dropping from its natural line, and keep the fractured surfaces in perfect contact. The first is done by properly placing a small pad under the trochanter major, between it and the mattress; and the second by a padded splint, *q*, *r*, placed along the outer side of the thigh, and secured to the pelvis and lower part of the thigh by two simple bands, *t*, *s*, which should be tied round the pelvis, so as to exert a sufficient degree of pressure to keep the fractured surfaces in contact. In fractures of the *trochanter major above the neck*, the limb should be kept in a position to allow of the great toe being in a line with the anterior superior spinous process of the ilium. Unless, in these cases, there is fracture also of the neck of the bone, it is unnecessary to keep up extension: it suffices to apply the middle of a four-tailed bandage over a pad of lint just above the trochanter; two of the tails of which should be carried round the pelvis and drawn rather tightly, to prevent the bandage from slipping off; and the remaining two, also upon a pad, round the upper part of the thigh, and fastened as close as the case may require. The object of this bandage is to counteract the contraction of those muscles which have a tendency to separate the fractured surfaces. A splint should also be applied along the outer side of the thigh as in fracture of the neck: its object is to keep the trochanter in a proper line with the shaft of the

bone. In fractures *between the trochanters, just below the neck,* the same position is necessary as in fractures of the neck of the bone; the trochanter prevented from dropping by a hard pillow being placed beneath it, and the upper and lower fragments kept in a proper line by means of the side splint lightly applied. In fractures *below the trochanter minor,* the limbs ought to be placed over the double inclined plane, fixed at a right angle, and the injured limb extended to its natural length by the elongation of the middle plane. A common splint, well padded, and long enough to reach from the tuberosity of the ischium to the ham, should be placed under the thigh upon some straps, another upon the outer side, another upon the inner, and a fourth upon the front of the thigh. They should keep up a pressure, judiciously regulated, upon the limb, by means of straps and buckles. *u u,* represent the bed-clothes thrown back.

3. M. Dupuytren's Bandage for the same.

Composition.—Several cushions of different sizes to form a double inclined plane;—a common sheet.

Application.—Three or four cushions, decreasing in size from below upward, are placed under the ham; the rest of the cushions are so disposed as to form a double inclined plane. The thigh is made to repose upon the plane which corresponds to it, while the leg in a state of flexion rests upon

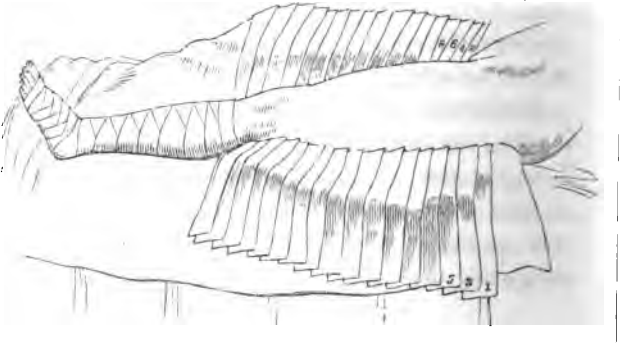
the other. The limb is maintained in this position by means of a sheet folded like a handkerchief, the central part of which should embrace the foot, while the extremities are attached to the sides of the bed.

Observations.—This apparatus is similar to that employed by Sir A. Cooper in fractures of the neck of the thigh-bone within the capsular ligament: when the fracture is without, that gentleman prefers the double inclined plane of Sir Charles Bell, page 42. See Popliteal Saddle, described at page 172.

4. Bandage of Scultetus for Fractures of the Body of the Femur.

(Syn. Many-tailed Bandage—Bandage à bandelettes séparées, Fr.)

Composition.—Five bands or tapes, a yard long and two fingers' breadth wide, to be placed, three under the thigh, and the remaining two under the leg, fig. 1;—they should be lined along their



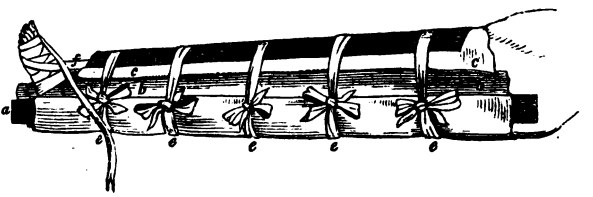
middle third, to prevent them when tied from becoming twisted;—a large piece of linen, to serve for splint-wrapper, a yard wide, and a little longer than the limb;—a quantity of bandelettes, three fingers' breadth wide, each long enough to make a circular and half about the limb, and sufficiently numerous to cover it in its entire length in overlapping each other by about half or two-thirds of their width, fig. I. 2, 4, 1, 3, &c.;—two or three longitudinal compresses, several times folded, to surround lengthwise the injured limb: they should be saturated upon their application with an appropriate lotion; they serve also for preserving the bandelettes from the contact of pus or blood;—three splints: the external one should extend along the outside of the limb from the crest of the ilium to a little beyond the foot; the internal one, along the inside of the same, from a little below the pubes to the same distance; and the anterior one from the upper part of the groin nearly to the bend of the instep;—three cushions of oat-chaff, of the same length as the limb, to be interposed between the splints and bandelettes;—lastly, a roller a yard and a half long to cover the foot, and a band to support the same.

Application.—The several objects of which the apparatus is composed being placed over the pillow upon which the limb ought to rest, the patient should be carried to the bed, the fractured limb

extended along the middle of the apparatus, and the reduction proceeded with forthwith. The limb having resumed its natural length, the assistants are still to continue the reductive efforts, while the roller is applied upon the foot, and the wetted compresses placed along the thigh. That done, the bandelettes are applied, in succession, from the lower part of the leg to the upper part of the thigh; for which purpose the surgeon takes hold of the extremity nearest himself of the last bandelette, an assistant, opposite, fixing the other extremity, and extends it completely across the limb in the form of an oblique circular; taking next the extremity held by the assistant with one hand, while with the other he maintains the first firmly in position, he applies it in like manner obliquely round the limb, to intersect the first upon its fore part: the extremities should always be carried underneath the limb, and if too long, a portion should be cut off or carefully folded under.

When the bandelettes are all applied, the splints, fig. 2, *a*, are rolled up in the longitudinal borders of

Fig. 2.



the wrapper to about two fingers' breadth from the limb, and then, being a little elevated, the two cushions, fig. 2, *b*, are carefully introduced. The third cushion is then applied along the fore part of the member, and above that, the third splint, fig. 2, *c c*, *d d*. The assistant now embraces with both hands the entire apparatus, while the surgeon fastens the tapes, commencing by the one that corresponds to the middle of the thigh, knotting them on the outer side of the limb, fig. 2, *e e e e e*. Lastly, the middle of the band is applied upon the sole of the foot, and the extremities, after being crossed upon its fore part, are pinned to the lower part of the apparatus, fig. 2, *f*.

Observations.—This is an extremely simple and efficient apparatus for transverse fractures of the shaft of the femur, and may be readily passed underneath the limb without disturbing it: one great advantage that it possesses over the eighteen-tailed bandage is, that each bandelette, when it becomes soiled, may be removed without displacing the whole apparatus. It may be employed equally in fractures of the arm and leg.

5. Eighteen-tailed Bandage.

Composition.—To a strip of roller, four fingers' breadth wide, and as long as the limb, are stitched, crosswise, eighteen others of equal width, and sufficiently long each to make a turn and a half about

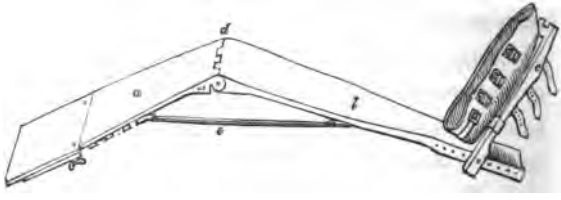
the limb, from the upper part of the thigh down to the ankle. They ought to cover each other from above downwards by about two-thirds of their entire breadth, and have a slight degree of obliquity relatively to the longitudinal piece, to facilitate their application upon the limb.

Application and Use.—See bandage of Scultetus, page 160.

6. Mr. Amesbury's Apparatus for Fracture of the Middle and Lower Thirds of the Femur.

Composition. — The apparatus is divided into three portions, independent of splints and straps; one of which is for the thigh, fig. 1, *a*; another for

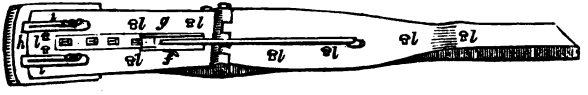
Fig. 1.



the leg, *b*; and the third for the foot, *c*. There are two thigh-pieces made to each apparatus, one of which is bevelled off at the lower end to the right and the other to the left, so that when one of them is fixed to the leg-piece, which is hollowed out to receive the back of the leg, the leg and thigh-piece together are adapted to the natural line of the

right limb; and when the other thigh-piece is joined to the leg-piece, they are adapted to the natural line of the left limb: this arrangement Mr. Amesbury considers necessary, in order to preserve the figure of a perfectly formed limb, which is not straight, but turns inward a little at the knee. The leg and thigh portions are connected by means of a little steel or brass pin, *d*. Behind the apparatus is a steel bar, *e*, coated with brass, and fixed to the back of the leg-piece. To the upper end of this bar is fixed what Mr. Amesbury calls a brass foot, fig. 2, *f*, to which is attached a bolt

Fig. 2.



acted upon by a spring. There is a hole in the centre of this brass foot, which is traversed by the bolt in the transverse direction. At the back of each thigh-piece is a rack, *g*, with several projections, each having a hole bored through the middle, for the purpose of receiving the bolt attached to the brass foot-piece. The foot-piece is connected with the steel bar in such a manner as to be easily fixed upon either of these projections. By being fixed upon either of these, except that nearest the leg-piece, the leg and thigh-pieces become fixed together so as to form a double inclined

plane, (see fig. 1;) the angle of this may be varied at pleasure by altering the position of the brass foot-piece from one of the teeth or projections of the rack to another. At the upper end of the thigh-piece is a sliding brass plate, *h*, fig. 2, so adapted that it may be applied to either of the thigh-pieces at pleasure. This contrivance allows of the thigh part of the apparatus being adapted to thighs of various lengths. The upper end of this plate is turned off, so that, when it is properly padded, it may bear against the tuberosity of the ischium without injuring the integuments. At the back of the sliding plate are placed a couple of brass bars, *i i*, which answer the double purpose of rendering the sliding plate more secure when it is fixed upon the thigh-piece, and of preventing the pelvis-strap, to be noticed presently, from slipping from the apparatus. There are little studs, *l*, placed at the back of the apparatus, for the purpose of receiving the straps by which the apparatus is confined to the limb.

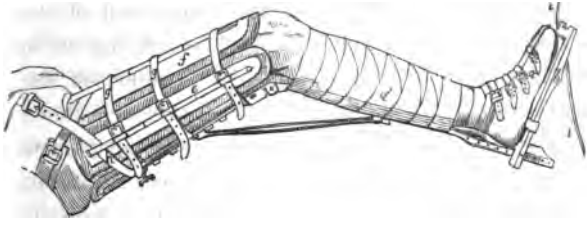
The pelvis-strap is of leather, furnished with a sliding pad, and is long enough to reach round the thigh and round the pelvis.

Three short splints are also required, to be placed upon the thigh.

Application.—The apparatus and splints being properly padded, the surgeon commences by placing the pelvis-strap between the bars and the plate or

sliding portion; he then applies a single-headed roller, *d*, fig. 3, spirally about the leg from the toes

Fig. 3.



to the bend of the knee. In the next place, an assistant takes the small of the leg in one hand, and places the other under the knee to raise the limb, and at the same time to keep the knee bent while the surgeon places the apparatus under it. When the limb is properly placed, the shoe, *a*, previously padded in the inside, is buckled to the foot, while the foot-board, *b*, and leg-piece, are placed at nearly right angles: this gives the foot support, and steadies it. The leg is to be supported along the whole of its under surface in order to give it an equal bearing upon every point of the apparatus, and this is done by means of tow or wadding, *c*, placed under the small of the leg, between the long pad and the leg-piece. The leg is fixed upon the apparatus by a roller carried spirally round both, from the ankle to the bend of the knee.

To confine the fractured parts in their natural position, the assistant takes the apparatus and the

knee between his hands, and extends the thigh gradually in a line with the thigh part of the apparatus, which the surgeon supports against the back of the thigh. When the surgeon has co-apted the fragments of the bone, he applies the splints; the first, *e*, on the outer side of the thigh, from the great trochanter to the lower part of the outer condyle; the second on its inner side, reaching from the pubes to the lower part of the inner condyle; and the third, *f*, upon the fore part of the thigh, from a little below the superior anterior spinous process of the ilium, to the base of the patella. The splints are kept in place by the straps, *g g g*, fixed to the studs on the back part of the apparatus. Lastly, the pelvis-strap, *h*, is to be carried round the limb, under the strips of leather of the splints, and made to cross on the outer side, while the *buckle-end*, with the sliding pad, is carried round the pelvis and made to meet the other end in front, where it should be buckled. The tapes, *i i*, serve for fixing the lower part of the apparatus to the foot of the bed.

HYPONARTHECIC APPARATUS, FOR FRACTURES OF THE FEMUR.

7. Femoral Hyponarthecia.

Composition.—A board of convenient breadth, and of sufficient length to extend from the tuberosity of the ischium to the bend of the knee; it

should be perforated with a mortise at each border close to its upper extremity, and with a gimlet-hole at each border near its lower extremity;—a cruro-bis-iliac cravat;—a *cravat of fixation* of greater central breadth;—a cushion of the breadth of the board, but a little longer,* in order, when turned down at its extremities, to serve for protection to the tuberosity of the ischium and the upper and back part of the leg against the ends of the board;—lastly, two cords, the one to serve for the arc-loop of the board itself, the other to connect this with a pulley or staple affixed to the top of the bed or ceiling.

Application.—The board being cushioned, and the limb made to repose thereon, the surgeon proceeds to the application of the cruro-bis-iliac cravat; he fixes one extremity of this to the inner border of the board by passing it through the corresponding mortise, and then conducts it, first, over the groin of the affected side, then round the ilium and across the sacrum to the ilium of the opposite side, from whence he conveys it obliquely downward over the pubic region to the outer mortise, to which he firmly attaches the other extremity. The board being thus properly secured at its upper part, he directs his attention to the limb,

* M. Mayor often employs a cushion extending from the ischium to the heel: the free end of the cushion acts commodiously in supporting the leg.

in order to assure himself of the accurate juxtaposition of the fractured extremities of the bone, and applies the centre of the remaining cravat upon the anterior face of the thigh; carrying the tails of this, downward, to the under surface of the board so that it may embrace the limb and apparatus in order to constitute one whole, he knots the two extremities, firmly, upon the outer border. Lastly, passing the two ends of the first cord through their corresponding gimlet-holes, he knots them underneath the board, and thus forms the arc-loop. Passing one end of the second cord through the pulley or staple, and the other through the arc-loop just described, he is then enabled to execute the suspension; which being duly regulated, the extremities of the cord have only to be connected by means of a knot or bow.

Use.—In simple transverse fracture, only, of the shaft of the femur.

8. Simple Femoro-tibial Hyponarthecia.

Composition. — A board of convenient breadth and of sufficient length to extend from the ischium to some distance beyond the heel; (this board, like the preceding, should be perforated at its upper part with two mortises, and at its lower with two gimlet-holes: the latter should correspond to the narrow part of the leg just above the malleoli; it should likewise be furnished with a ring-screw at

its lower extremity, together with a cushion;)—a cruro-bis-iliac cravat;—a calcaneo-metatarsal cravat;—lastly, two cords as described in the above apparatus.

Application.—The limb being made to repose upon the cushioned board, the cruro-bis-iliac cravat is to be applied as described above, and the fractured ends of the bone being carefully adapted, the calcaneo-metatarsal cravat is to be adjusted in the following manner; viz. placing the centre of the cravat against the lower and back part of the ankle, the surgeon conducts the tails obliquely forwards to the metatarsus, crosses them, and carries them, from thence, to the sole of the foot, where he forms a single knot, and, lastly, secures their extremities firmly to the ring at the end of the board. See the Calcaneo-metatarsal cravat at fig. 13 of the lithographs.

Use.—In fracture of the shaft of the femur.

Observations.—This, like the apparatus last described, will be found useful in transverse fractures of the shaft of the bone; in oblique fractures, however, it will require in addition a cravat of fixation, or one or more traction ligatures, (see page 46,) to be adapted according to the nature of the case. This apparatus will serve in case of need as a substitute for the *Articulated Femoro-tibial Hyponarthecia*, (to be described further on,) in oblique fractures of the femur, or even in fractures of the neck

of that bone; but not being so secure a means, it has only its extreme simplicity and easy construction to recommend it.

9. Popliteal Saddle.

Composition.—It may be constructed of a variety of materials, but perhaps the best would be found to be two or three hoops of steel or elastic wood overlaid with strong leather. The object of this apparatus is apparent; it is intended to preserve the lower extremity in a state of flexion, and performs the part of the pillows of Dupuytren, described at page 159. The inclined planes should extend along the posterior face of the thigh and leg to the distance of about six inches from the bend of the knee, and being connected at their base by a couple of leather straps and buckles, they may be made to regulate in a very simple manner the degree of flexion. The popliteal saddle, therefore, not only possesses the advantage last described, but, by being constructed of solid materials, assures a positive degree of certainty to the flexion given in the first instance to the injured limb. It may be provided also with a cushion, which, in nowise affecting its qualities, as above described, will insure the member an inappreciable degree of ease.

Application.—With regard to the suspension, it may be effected in the usual manner, that is to

say, by an arc-loop passing under the bend of the saddle, through which a second suspension loop is made to pass, which may be conducted through a pulley or through a staple, affixed to the top of the bed or to the ceiling. When the limb, therefore, reposes on the saddle, and the suspension is effected, the next thing to consider will be the resistance offered by the patient's body to the state of suspended flexion imposed upon the limb. Now the weight of the limb will be precisely in proportion to the approximation of the heel and ischium; in other words, to the degree of elevation of the knee. Should, then, the weight of the patient's body be insufficient to offer the resistance necessary to guarantee this nice balance of forces, such resistance may be increased to the necessary degree by the application of a sheet, folded cravat-like, which will be made to surround the pelvis, and fix it to the bed.

Use.—The same as Dupuytren's pillows, but a much more convenient and effectual apparatus.

10. Articulated Femoro-tibial Hyponarthecia.

Composition.—Two boards must be procured of convenient breadth, and of sufficient length to extend, the one, fig. 1, *c*, and fig. 11, from the tuber of the ischium to the bend of the knee, and the other, fig. 2, from the bend of the knee to a short distance beyond the heel. These boards are arti-

culated at the knee-joint by means of hinges, fig. 11, *e*, or otherwise by simple ribands, which should be made to pass through the holes with which the articulating extremities of these boards are pierced, in order to be knotted underneath. In addition to the two holes in each board, above described, there should be two others perforated at the angles of the upper extremity of the femoral, and two at those of the lower extremity of the tibial. At the lower extremity of the tibial board, fig. 2, should be perforated six mortises, the use of which will be to receive the feet of the ladder, fig. 3, which is destined to serve as a moveable foot-board. In the next place, attention must be paid to the means of fixing the articulated board thus described to the injured limb: these consist, firstly, of a quilted belt of the form of that represented at fig. 11, or of the one represented by fig. 10, for the purpose of connecting the upper part of the apparatus with the pelvis; secondly, of a heel-strap of similar material, fig. 5, *a b c d*, the use of which will be to keep the foot fixed to the ladder, as seen in figs. 1 and 6; and, thirdly, of a fixation-ligature, fig. 4 and fig. 1, H, destined to act upon the most convex portion of the thigh, or even upon the part corresponding to the fracture. A cushion must be procured of the entire length of the double board, or indeed a little longer, for the purpose of allowing of its upper end being folded backward, in order to guarantee the

tuberosity of the ischium from the rude pressure of the femoral board. Lastly, for the suspension, some stout cord must be procured, to be used in the manner about to be described, and also a couple of pulleys.

Application.—The two pulleys being in readiness, let one be attached to the top of the bed or ceiling; then, let the second be connected with the first by means of a bit of cord, as shown in fig. 1. Let the arc-loops now be formed, in the following manner, with a second and much longer piece of cord; viz. let each end of this cord be introduced through the corresponding gimlet-hole at one extremity of the board from below upward, and, after being drawn to the same length, passed first through its respective groove of the lower pulley, then downward through the corresponding hole of the other extremity, and firmly knotted to its fellow underneath. These parallel bows of equal length being now sustained at the middle, will suspend the board as a perfect plane, or allow of its receiving more or less inclination either way, according to the distance on one side or other of the centre, upon which the point of support is made to act. As to the elevation of the entire apparatus, this depends upon the cord which connects the two pulleys, and which may be made to heighten or lower the apparatus by altering the bow that unites its extremities. But in order to form the two inclined planes which are to support the limb in demi-

flexion, a small cord, *b b* (same fig.) should be passed, from below upward, through one of the holes of the upper extremity of the tibial board, across the point of support, that is to say, the lower pulley, and thence, from above downward, through the other hole of the same extremity, under which the two ends should be knotted together. In this way the extremities of the two boards, which correspond to the bend of the knee, may be made to describe an angle, more or less acute, according as the limb is required to be placed in a greater or less degree of flexion. The femoral portion of the board has now to be secured to the pelvis. This is effected by means of the quilted band, *d*, fig. 11. This band, if employed in preference to the one represented by fig. 10, should be of sufficient length to pass as a belt round the body, and terminate by a strap, *a*, to be attached to a strap and buckle, *b*, *c*, fixed to the external and superior part of the board. This band serves at once as a body-bandage and thigh-strap; it passes first of all upon the groin of the injured limb, then round the corresponding ilium and along the back, and is returned over the pubes to the upper part of the fractured thigh, where the buckle fixed to the outer side receives it, or where, when this is wanting, it may be fastened to some other convenient point of attachment. This belt, which, as may be perceived, tends to fix securely the femoral board

upon the pelvis, is employed with the notched portion of the board against which the tuberosity of the ischium rests, to operate the counter-extension, or, in other words, the resistance necessary to meet the tractions of the heel-strap; while the latter acts at the same time upon the limb which it elongates, and upon the board which it pushes upward, first beneath the ham, and then upon the ischiatic tuberosity. The board being now attached at its upper extremity, and the fracture reduced, the ladder is to be introduced into the mortises. The object of this foot-board is to fix the heel-strap, fig. 5,—which on the one hand embraces accurately the instep, heel, and malleoli, fig. 1, G, secured by the tapes, *c*, and, on the other, is attached by means of two broader tapes, fig. 5, *d d*, which terminate it,—to one of the sides of the ladder, according to the direction desired to be given to the limb. Lastly, the fixation-ligature, fig. 1, H, and fig. 4, is applied by its centre, *a*, upon the face of the thigh, and knotted underneath by means of its extremities, *b c*. It would, perhaps, be advisable to pass these extremities through mortises perforated at the borders of the femoral board. Nothing now remains to be done but to regulate the suspension according to the method already pointed out.

Observations.—It will now be perceived that by means of the garter on the one hand, and the foot-

frame and heel-strap on the other, the elongation of the limb may be operated, and the overlapping of the fractured ends effectually prevented. The extension is produced and maintained by the heel-strap, and the counter-extension by the weight of the body and the fixture of the limb upon the apparatus; while the heel-strap itself prevents rotation, inwards or outwards, of the lower fragment. The advantage of the pulleys in the hyponarthecic apparatus is conspicuous at first sight; they allow the cords to glide with such freedom in the arrangement of the suspension, that the possibility of imparting to the patient the slightest shock is totally obviated. But, when the due degree of elevation has been effected by means of the pulley, A, (figs. 1 and 6) and that of inclination, also, regulated by means of the second pulley, B, (same figs.) this free sliding of the cords would be detrimental to the treatment of the case, from the circumstance of the board being liable to alter its position by the least movement of the patient; and it is therefore advisable to tie the two parallel bows together near the pulley, as seen in fig. 1, and then introduce between the latter and the ligature a little splinter of wood, which will have the effect of preventing the bows from retrograding. Care should be taken beforehand to arrange the patient's bed, by pressing it down at the part corresponding to the apparatus, in order that the horizontal movement be not in-

terrupted. As soon as the limb has been elevated to a certain height, it is advisable to place a pillow underneath the board, which should remain there till the fracture is reduced, and the position, &c. of the limb conveniently arranged. The suspension apparatus when isolated yields to the slightest impulse imparted by the patient in his movements, occasioning neither shock nor pain.

Although, in the majority of cases of fracture of the femur, the means just pointed out will suffice to effect the proper co-aptation of the fragments, yet sometimes recourse must be had to traction ligatures; as, for example, where there is a disposition to lateral displacement. Sufficient has been said of the objects of these ligatures, or directing-bands, as they are often called, in speaking of them at page 46; but their application will be perhaps better understood by reference to figs. 8 and 9, where they are employed, as will be seen, in fractures of the leg, in which cases they can rarely be dispensed with.

A more recent improvement of the articulated femoral hyponarthecia consists in a jointed sliding board, represented by fig. 12, capable of being adapted to every kind of fracture of the lower extremity: the part, *a*, is destined for the thigh; *b*, for the leg. These parts may be separated, or united, by means of a rod, *e*, which runs through a hinge joint; the femoral portion, *a*, may be aug-

mented at will by the slide, *c*; as may also the tibial portion, *b*, by the slide, *d*. To regulate the lengthening or shortening of these slides, two thumb-screws, *f*, *g*, are employed, which may be equally introduced at the other side of the board in order that they may be always on the outside. The points observed along the borders of the board indicate small holes destined to receive the ring-screws which serve for the attachment of the extremities of the ligatures of traction and fixation, permitting these to vary in situation according to the nature of the case. The borders of the slides themselves may also be provided with these holes, in order, if necessary, to receive ring-screws. The foot-frame may be either articulated with the board in the same way as the two portions of the board are articulated at the centre, or else by means of mortises. The two oval holes observed at the superior part of the femoral portion serve for receiving the extremities of the cruro-bis-iliac cravat or pelvic bandage. In fig. 13 this apparatus is represented in action; the foot-frame is substituted by the calcaneo-metatarsal cravat, attached to a ring-screw introduced at the extremity of the board. In the same figure is observed a modification of the suspension cords, the degree of flexion to be given to the limb being regulated by the elevation or depression of the point of the arc-loop of either side upon which the vertical cord is made to act.

It will now readily be conceived how great might be the utility of the articulated femoro-tibial hyponarthecia in any painful diseases seated upon one or other of the limbs, as well as in certain white-swellings, in arthritic and rheumatic tumefactions of the foot, or in any other serious affections of the knee, or of the articulation of the foot and leg. Its use might be extended to the treatment of transverse wounds of the thigh, or of the tendo Achillis, for which the most perfect immobility is indispensable. There cannot be a better means, so long as the immobility of the affected parts is properly insured, of allowing the patient to vary his position in bed.

11. Uniting Bandage for the Coxo-femoral Amputation.

Composition.—A single-headed roller seven yards long;—some strips of adhesive plaster;—some lint or charpie;—and lastly, several longitudinal compresses.

Application.—When the operation is terminated, the flaps are brought together and maintained in place by means of the adhesive plaster, over which are properly applied the lint or charpie, and the longitudinal compresses; the dressing may be then confined by the "Spica of the Groin," or a figure of 8 bandage, constructed in the following manner: two horizontal turns are first made round the pel-

vis, a little below the superior iliac crests, and the head of the roller being carried obliquely downward, and about the lower part of the nates, is returned across the groin to effect a third circular about the pelvis; a second oblique circular is then carried round the nates, and a fourth horizontal one about the pelvis; these oblique and horizontal turns are once or twice more repeated, and the bandage terminated by a few circulars about the pelvis. See *Observations* to the following bandage.

12. Cruro-iliac Triangle.

Application.—Fix upon the patient, in the first place, a pelvic cravat. Then, taking a triangle, apply its base immediately below the great trochanter, pass the tails transversely about the corresponding part of the thigh, cross them, and secure their extremities by a knot or pin. In the last place, raise the summit of the triangle and attach it to the pelvic cravat: it will be thus found to embrace in the most complete manner possible the gluteal region.

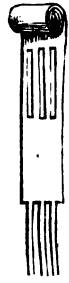
Use.—For retaining dressings applied upon the gluteal region.

Observations.—By varying a little the position of the triangle it may be made to act extensively upon the upper part of the thigh. By a modification similar to that of the humero-scapular triangle as adapted to amputations at the shoulder-

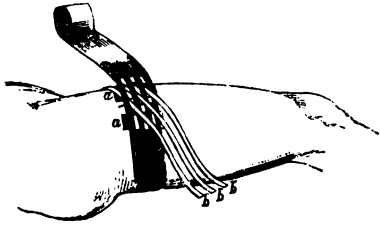
joint, it may be made to serve, also, for confining dressings in the coxo-femoral amputation.

13. Uniting Bandage for Longitudinal Wounds of the Thigh.

Composition.—One end of a piece of linen, of sufficient length to make three or four circumvolutions round the member, and of a breadth correspondent to the length of the wound, is divided so as to form three bandelettes, about an inch broad, and long enough to embrace three-fourths of the circumference of the limb: at a convenient distance further on, are made three longitudinal perforations, opposite to, and of the same breadth as the bandelettes. The remainder of the band is then rolled up;—two common graduated compresses also are required.



Application.—The undivided portion, situated between the bandelettes and the perforations, being applied upon that part of the limb which is exactly opposite the wound, the graduated compresses, *a a*, are placed one on each



side of the latter, at the distance of about three fingers' breadth from its edges; the bandelettes, *b b b*, are next passed through the corresponding perforations, *c c c*, and the surgeon brings the edges of the wound in contact, by drawing the extremities of the band in contrary directions: the rest of the application consists in firmly securing the bandelettes by some circulars made with the remainder of the strip of linen.

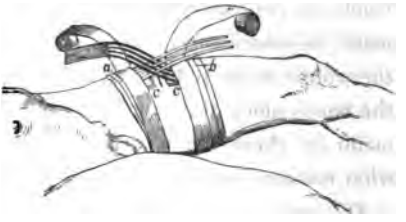
Observations.—This bandage may be used in longitudinal wounds of the upper as well as of the lower extremities. It may often be replaced, however, with advantage, by strips of adhesive plaster, over which a common dressing should be applied, and confined by a single-headed roller: the strips may be applied about a quarter of an inch apart where great closeness is required, or otherwise they should be more distant; this is an extremely necessary precaution, as the confinement of blood, and still more of any extraneous body, would be liable to occasion the formation of an abscess, that would speedily disunite the parts. See page 29. The band in this instance may also be replaced, and that, too, in a most effectual manner, where the wound is very extensive, by a couple of cravats applied about the limb in the following manner: viz. Place the middle of the cravats—through each of which, at a convenient distance from one ex-

tremity, a slit has been perforated—upon the limb, exactly opposite the injury; then, passing the tails of one side through the corresponding perforations of those of the other, pull the extremities of the two in contrary directions, lay them down, and properly secure them, by means of either pins or stitches.

14. Uniting Bandage for Transverse Wounds of the Thigh.

Composition.—A piece of stout cloth of the same width as the wound, and as long as the member, is to be divided to nearly half its length into three tails or bandelettes; another and similar piece of cloth should be perforated in the middle with three corresponding longitudinal openings. The remainder of the objects consists of two common graduated compresses, and two single-headed rollers, one six and the other nine yards long, both three fingers' breadth wide.

Application.—The limb is put into complete extension; the surgeon applies the initial extremity of the longest roller upon the side of the pelvis corresponding to the wound, fixes it by two or three horizontal circulars, and conducts the head



of the roller along the thigh in doloires, *a*; that done, he extends the perforated band along the limb, observing to allow the upper extremity to pass a few inches beyond the last turn of the roller, and the openings to lie upon the wound; he fixes a portion of the upper extremity, by means of two or three circulars carried round the limb, at some distance above the solution of continuity, and reflecting what remains of it downward, secures it by a few more turns. Confiding now the head of the roller to an assistant, he takes the remaining roller, fixes its extremity below the knee by a few circulars, and carries the head spirally to the lower part of the thigh, *b*: next, placing the split band along the limb, the tails directed toward the wound, beyond which they should extend by about three-fourths of their entire length, he fixes its lower or undivided portion, in the same manner as he had done the upper portion of the first band, and resigns the head to an assistant. Lastly, having applied the compresses, *c c*, one above, and the other below the wound, he engages the bandelettes in the corresponding perforations, and draws these free extremities of the

bands in contrary directions, in order to approximate its edges: when he considers the edges of the wound to be sufficiently in contact, he extends the bands along the limb, and while the assistants maintain them firmly fixed, confines them with what remains of the two rollers.

Observations.—This bandage may be replaced by the following, which, in point of fact, is a *dry suture.* Let two long strips of adhesive plaster (spread on strong linen) be procured, together with several bits of narrow tape. The parts being put into a complete state of relaxation, pass the strapping about the limb, above and below the wound, at a convenient distance from its borders, as represented in the wood-cut; then, passing through these two bands the bits of tape, tie their extremities together. But whichever of the two means just described be employed, it will in general be necessary to give the divided parts greater support than either of them can effect alone: recourse must therefore be had, under such circumstances, and in order to afford this additional support, to bandages calculated to ensure the approximation of the edges of the wound. Thus, in divisions of the flexor muscles, the limb must be kept

bent; while, on the contrary, in cases where the extensors are concerned, the limb should be maintained upon the full stretch by the application of a splint made to pass along it, upon the side opposite the injury.

15. BANDAGE FOR AMPUTATION IN THE CONTINUITY OF THE THIGH, WHEN THE WOUND IS TO BE HEALED BY THE FIRST INTENTION.

Composition.—A double-headed roller eight or ten yards long and three fingers' breadth wide;—a single-headed roller of the same width, three yards long;—two long and broad slips of adhesive plaster, and two narrower ones;—some lint;—and lastly, a broad band of about half a yard in length, or a Maltese cross.

Application.—About two-thirds of the double-headed roller being passed about the pelvis as a spica, previous to the commencement of the operation, the remainder is to be conducted about half-way down the stump, and pinned: the edges of the wound are now to be brought into contact, first by means of the broad strips of plaster, applied across the middle of the stump, about half an inch apart, and secondly by the narrow strips applied near the corners: the ligature should be allowed to hang down over the lower strip. That done, the lint lightly smeared with ointment should be applied with great accuracy upon the face of the stump, and covered by the band carried from

the outside to the inside of the thigh, or by the Maltese cross; the dressing is to be confined by means of the second roller, which is to be applied over the termination of the first, and brought down to the wound.

Observation.—The rollers, besides confining the dressings, tend to overcome spasmodic contraction of the muscles. In cases of great inflammatory action and swelling, which occasionally succeed the operation, the small one may be readily loosened, without disturbing the rest of the bandage.

16. BANDAGE FOR AMPUTATION IN THE CONTINUITY OF THE THIGH, WHEN THE WOUND IS INTENDED TO BE HEALED BY THE SECOND INTENTION.

Composition.—A band eight or ten yards long and three fingers' breadth wide, rolled up into two heads of different sizes; a single-headed roller of the same width, about three yards long;—some lint or charpie, and a cribriform compress;—several strips of adhesive plaster;—and lastly, five thin longitudinal compresses, one longer than the rest, and rather more than sufficient to surround the stump.

Application.—The double-headed roller is to be applied about the pelvis and brought half-way down the stump, in the form of a spica, and then as far as the border of the wound in simple circulars with what remains of the longest head. The surgeon now carefully applies a simple dressing upon the

face of the stump, prepared either with the lint or with the charpie; if the latter be employed, the cribriform compress smeared with a little simple ointment should be first applied upon it, and over this the charpie; the dressing should be maintained by the strapping applied from within outward; over the adhesive plaster should be applied a plumasseau of charpie, confined by means of the longitudinal compresses, two of which should extend from the external to the internal side, and two from before backward; the extremities of these compresses are to be fixed by the longest of the five, carried transversely about the stump, and the whole dressing secured by a *capelina*. To construct this, the surgeon takes the second roller, and fixes the extremity by a couple of circulars, applied at the middle of the stump; he next reverses the roller at one side or other of the limb, and places the thumb and two first fingers of the left hand upon the reverse in order to maintain it; directing now the head of the roller downward and across the lower part of the wound, he conducts it along the side opposite, to make a second reverse and a circular and half; re-commencing the two reverses in the manner just described, and the circular and half to fix them, he surrounds the face of the stump entirely from below upward, and terminates the bandage by doloires carried down to the border of the wound. See Triangle-cap, page 129.

17. FIGURE OF 8 BANDAGE OF THE KNEE.

Composition.—A single-headed roller four yards long and three fingers' breadth wide.

Application.—Two circulars being made about the lower part of the thigh, in order to fix the initial extremity, the head of the roller is carried across the knee obliquely, to effect a circular at the upper part of the leg; from hence it mounts to the lower part of the thigh, which it again surrounds transversely, after crossing the first oblique turn upon the knee. The remainder of the roller is employed in the same manner, and the end fastened with a pin.

Use.—To exert compression on the knee, or confine dressings either upon or behind it, according as the roller is crossed anteriorly or posteriorly.

18. WEISS'S ELASTIC KNEE-CAP.

It is made of an elastic tissue lined with India-rubber, lacing at the side, as seen in the drawing. It is much preferable to the common figure of 8 bandage, where compression is required.

19. SCOOLBRED AND RENWICK'S METALLIC ELASTIC KNEE-CAP,

Of which the same may be said in regard to its utility, has nearly the same form as the preceding.

It is lighter than the one above, and is pervious to the transpiration.

Observations.—The two last bandages are particularly useful in cases of dislocation of the patella, when the ligaments are in so relaxed a state as to render a recurrence of the accident probable.

20. Bandage for Transverse Fracture of the Patella.

Composition.—Two single-headed rollers, each eight yards long and three fingers' breadth wide;—a band rather longer than the limb, and a little broader than the patella;—two longitudinal compresses;—lastly, a cushion and splint of the length of the limb.

Application.—The patient lying on his back, an assistant raises the limb by taking hold of the foot, and the surgeon places the band along the anterior face of the limb, fixing it at the ankle by a few circulars of one of the rollers. That done, he reflects upward the extremity which corresponds to the foot, confines it by a few more turns, and proceeds with the roller to a little below the knee, by passing it spirally about the leg: on arriving there, he resigns it to an assistant, and reflects the upper part of the band, downward, upon the leg: he now puts the fragments of the bone in apposition, and places the middle of one of the compresses immediately

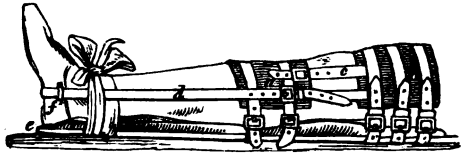
above the upper fragment, bringing the extremities obliquely backward and downward alongside the ham; he places in the same manner the second compress below the lower fragment, and conducts the extremities obliquely from below upward, and from before backward. Extending the band again along the thigh, he resumes the roller, passes a few turns in the form of 8 about the knee, and ascends by spiral circulars to the upper part of the limb; he then reflects downward the superior extremity of the band, and descends along this reverse by fresh circulars, to the exhaustion of the roller. Lastly, placing along the posterior part of the limb, from just below the nates to the heel, the cushion and the splint, he confines them by means of the second roller. See Uniting Bandage, No. 14 of this section.

21. Mr. Amesbury's Apparatus for the same.

Composition.—Two pads to be placed, one above and the other below the knee, each about six fingers' breadth wide, and long enough to pass halfway round the limb: the pads are connected by two short straps, and buckles;—five straps, with buckles, to pass round the limb, three above and two below the knee, in order to fix them;—a long strap, to pass from the upper pad, to which it should be fastened, along one side of the leg and under the foot to meet a buckle attached to the

same pad on the other side;—a properly-padded straight splint to extend along the thigh and leg;—and lastly, a handkerchief, or a band about three-quarters of a yard long.

Application.—A shoe is first to be applied upon the patient's foot, furnished at the sides with two small loops, *f f*, and the leg extended upon the padded splint, *e*, after which the pads, *a b*, are placed above and below the knee, and secured, together with the splint, by means of the five straps men-



tioned above; the fragments are then to be brought into close contact by means of the short strap, *c*, and the long strap, *d*, which should pass through the loops of the shoe. The lower part of the splint is maintained against the leg by means of the handkerchief or band.

22. Rotular Hyponarthecia.

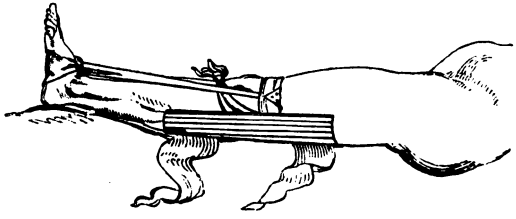
Composition.—A simple femoro-tibial hyponarthecic board, or, as represented by fig. 15, the sliding hyponarthecic apparatus;—a cushion;—three or four cravats;—and, lastly, a couple of cords to serve for suspension.

Application.—The limb being stretched along the cushioned board, the surgeon proceeds to fix in succession the cruro-bis-iliac, the supra-rotular, and the sub-rotular cravats, as represented in that figure. Should, however, a carelessness on the part of the patient exact it, a fourth or calcaneo-metatarsal cravat ought to be applied.

23. Compound Metatarso-rotular Cravat.

Composition.—Four cravats;—a hollow pasteboard or split deal splint;—some soft compresses.

Application.—The patient's limb should be placed in the most complete extension, and the heel kept elevated above the level of the ischium by means of a pillow. The centre of the first cravat is to be applied against the anterior part of the thigh immediately above the patella, its tails carried backward, crossed, and returned to the anterior part of the leg immediately below that bone; the two broken surfaces will now be in perfect co-aptation. The centre of the second cravat should then be applied against the sole of the foot, the tails loosely



knotted upon the metatarsus, and subsequently carried upward on each side of the knee to the supra-rotular portion of the first cravat, to which their extremities are to be attached, as seen in wood-cut. The sole of the foot here serves for a *point d'appui*, and this second cravat, aided by the respective positions of the leg, of the thigh, and of the pelvis, tends to counterbalance the action of the extensors of the leg; but, to obviate still more any possibility of flexion of the latter upon the thigh, which these cravats would not in all instances be enabled of themselves to counteract, recourse is had to a hollow splint, which is well lined with soft compresses, and is applied against the posterior surface of the limb. It is subjected in the simplest manner by the two remaining cravats.

Observations.—The limb may be put into suspension by means of the hyponarthecic system already described; care, however, being taken to maintain the heel at a greater elevation than the tuber of the ischium.

24. Sir Astley Cooper's Bandage for Dislocation upwards of the Patella.

Composition.—A long single-headed roller;—a well-padded splint to be placed behind the knee;—a leather strap and buckle to be applied about the lower part of the thigh: to this strap a buckle

should be fastened to correspond with the outer side of the thigh, while one end of a second leather strap, long enough to extend from the first round the sole of the foot to meet the buckle, should be fastened to it at its inner side.

Application.—The roller is to be carefully applied upon the foot and leg, and the limb placed in full extension; the padded splint being then applied behind the knee, the short strap is buckled round the lower part of the thigh, and the long one carried round the foot to be secured to the buckle fixed to the outer part of the first. The patient ought to wear a shoe having two bits of leather stitched to the sides for the purpose of giving passage to the long strap, and preventing it from sliding off the foot.

BANDAGES FOR FRACTURES OF THE LEG.

In cases of fracture of the tibia alone, or of the tibia and fibula together, the bandages of Scultetus, page 160, or of Boyer, page 153, may be employed, according as the fracture may be transverse or oblique; the lateral splints, however, of the bandage of Scultetus should extend from the lower part of the thigh only, to the ordinary distance beyond the foot, and the anterior one from the patella to the instep. The following is the method of treatment employed by Mr. Amesbury.

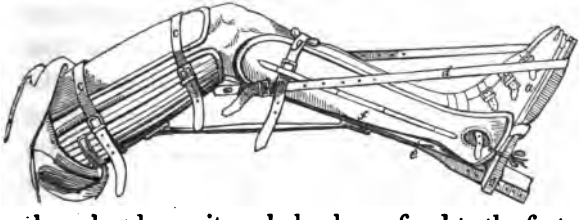
25. Mr. Amesbury's Apparatus for Fractures of the Leg.

Composition.—A thigh-piece, properly shaped to receive the back of the thigh, having a pair of lateral splints connected with it, and some studs for the retention of straps;—a leg-piece, immovably connected to the thigh-piece at an angle, and hollowed out for the reception of the back of the leg;—a foot-piece, which may be so shifted as to adapt the leg-piece to the length of the leg. The foot-piece should not rise higher than is necessary to form a right angle with the leg-piece when connected with it. There are some holes in each side of this, and a strap is attached to it, bearing upon one end a buckle;—a shoe, with a wooden sole, for the reception and retention of the foot, to which are attached two straps for connecting it with the foot-board; the shoe is supported by a foot-strap, which, when in use, extends from one side of the thigh-piece round the lower part of the foot-board, where it is passed under a strip of leather placed there to keep it in its place, and then carried up to the opposite side of the thigh-piece, where it is buckled.

The apparatus ought to be adapted to the sound limb in cases of simple fracture of the leg, and well padded; a small concave pad too should be placed on the inside of the heel of the shoe, and another

pad upon the sole. Two side splints are required, the outer one extending from the foot-board to the upper part of the outer condyle of the femur, and the inner one from the foot-board to the inner condyle;—also a split deal shin-splint; and in cases of oblique fracture a thin pad to be applied upon the instep, covered with a piece of pasteboard, a little wetted, which, when dry, serves to equalize the pressure and keep the instep easy.

Application—In the first or Inflammatory stage.—The shoe, *a*, containing the heel and sole-pads, should be carefully placed upon the foot; the instep-pad should then be placed upon the instep, and the



shoe closed over it, and closely confined to the foot by means of the buckles and straps attached to it for that purpose. An assistant should then place one hand under the knee, and, taking the foot in the other, raise the fractured limb, bringing it round so as to let it rest upon the heel. When the limb is raised, the surgeon places the apparatus under it, and brings the angle of the same opposite the bend of the knee, directing the assistant to lower the limb upon it.

The surgeon now fixes the shoe, *a*, to the foot-board, *b*, by means of the straps attached to the sole. By the aid of this shoe he is enabled to raise or lower the foot according to the length of the heel or thickness of the calf, so as to bring the lower portion of the fractured bones into a proper line with the upper, as far as respects any angular projection backward or forward. A padded splint should be placed upon the front of the thigh, and the whole of the thigh-part of the apparatus fixed to the thigh by means of the straps, *c*. That done, the foot-board should be raised nearly to a right angle with the leg-piece, and fixed in this position by the foot-strap, *d*, care being taken that the heel does not bear against the sole of the shoe. The fractured ends should next be noticed; and if the foot requires to be raised or lowered, it may be done by means of the strap which confines the shoe to the foot-board.

The part of the pad, *e*, which lies under the small of the leg, should be raised and supported in close contact with it by means of tow placed between the pad and this part of the apparatus, so that the whole length of the back of the leg may have an equal bearing upon the apparatus.

The lateral splints are next to be applied, the longest upon the outer side of the leg, and the shortest upon its inner side. The lower ends of

these splints should be fastened to the foot-board by means of narrow tapes passed through the holes at the sides, and the upper end kept close to the leg by the circular strap, *g*, passed round the limb over the splints and the apparatus.

With respect to the position, the limb thus fixed should be placed with the apparatus resting upon the heel; the two planes should be connected, as seen in the wood-cut, by means of the steel bar, which forms part of the apparatus for fractures of the thigh, described page 165, and the whole steadied by tapes attached to the foot-board, and passing off from thence to the sides of the foot of the bed. Surgical applications may be made by unbuckling the circular leg-strap, and throwing back the side splints.

When the inflammation is subdued.—Some strips of soap-plaster, each about an inch and a half wide, should be applied with very moderate tightness round the limb, and sufficiently close; they should pass from the ankle to a considerable distance above the fracture. The ends should be crossed on the sides or front of the leg, and cut off, so as to be easily turned back, when it is necessary to observe the state of the skin. Some strips, also, or a short roller, should be passed round the foot to prevent œdematous swelling in that part. When this is done, and the side splints re-applied, the shin-splint

should be properly adjusted, and the whole leg-part of the apparatus supported by three circular straps and buckles.

The cross-bar may be now removed, and the apparatus furnished with a sling or thong of leather fixed to the lower end of the leg-part of the apparatus; by means of this the limb may be moved passively at pleasure; the patient may recline upon a sofa, or rest his leg upon the seat of a chair. He may walk, too, with the assistance of crutches, passing in this case the sling over the neck, as in the ordinary way; the movements of the limb, however, should be always passive, and never by the action of its own muscles. In a fortnight or three weeks' time, according to circumstances, the foot-board should be shifted a little higher up the leg-piece, to press the fractured ends together, and hasten their consolidation.

Oblique Fractures.—In these cases extension must be made in the following manner:—the thigh-piece of the apparatus must first of all be pressed up closely against the back of the thigh, and the foot-board shifted down, so as to make the space between the foot-board and the thigh-piece longer than the leg; an assistant then grasps the foot and ankle in his hands, and makes gentle extension in the natural line of the bone, so as to bring the fractured parts into proper adaptation; when this is done, the surgeon keeps up the extension by

buckling the strap, which is fixed transversely to the shoe, round the foot-board. Great care must be taken that the broken extremities unite in the relative position which they naturally occupy; for this purpose auxiliary pads and rollers must be judiciously applied, according to the bone affected and the nature of the obliquity. The fullest particulars relating to this part of the treatment will be found in Mr. Amesbury's "Practical Remarks on the Nature and Treatment of Fractures of the Trunk and Extremities," published in 1831.

26. M. Dupuytren's Bandage for Fractures of the Lower Extremity of the Fibula.

Composition.—A cushion about two-thirds filled with oat-chaff, and of sufficient length when doubled to extend from the malleolus internus to the knee; —a strong splint two feet long and three fingers' breadth wide;—and two single-headed rollers from four to five yards long.

Application.—As soon as the fracture is reduced, the wedge-shaped cushion, *e*, with the base directed downward, is to be applied along the inner side of the leg; the splint, *b*, is next to be applied on this, and made to extend about four inches beyond the

sole of the foot; these two portions of the apparatus should be confined to the limb, *a*, above by one of the rollers passed in circulars round it, *c*, from just below the knee to about half-way down the leg, and below, by the second roller, carried round the foot and instep in the form of a figure of 8, *d*. Care should be taken in applying the second roller to draw the foot inward toward the splint, and maintain it firmly in the state of adduction. The posterior part of the limb should repose, in a state of demi-flexion, upon pillows made to form an inclined plane.

27. Tibial Hyponarthecia.

Composition.—A simple tibial board, as represented at figs. 2 and 6, perforated at the angles with four holes, and with mortises at the lower end for the reception of the ladder or foot-support; the oval fossa observed in fig. 2, *b*, serves to admit that part of the cushion which is pressed upon by the heel;—a cushion;—suspension cords and pulleys, as seen in same fig.; the method of constructing which has been pointed out at No. 7 of this section;—a heel-strap;—and, lastly, two or three bands or cravats to serve for fixation and traction-ligatures.

Application.—To commence, the suspension cords and pulleys are to be got in readiness, so that when every necessary measure has been taken, the board

may be swung by a due elevation being imparted to it through the means of the vertical loop. The board being then duly cushioned, the leg is made to repose thereupon, and the surgeon proceeds to set the fracture. That done, the fixation-ligature, F, fig. 6, is to be applied, which acts as a counter-extending force; then, the heel-strap being fixed to the outer or inner side of the ladder, according to the direction desired to be given to the limb, the directing-bands or traction-ligatures are to be adapted according to the direction taken by the fragments. No rule can be laid down for the number of cravats to be employed for this purpose, or for the position they are to maintain upon the fractured limb; their use has been fully explained at page 46, and it must be left to the nature of the case and the discretion of the surgeon to regulate their action. Let it, however, be clearly understood that the object of these traction-ligatures is to balance the diverging forces which act upon the two fragments, in order to maintain a perfect co-aptation: in observing the disposition of the ligatures at figs. 8 and 9, it will be perceived that the sub-rotular ligature and the foot-strap effect a resistance so much the more perfect as they are made to act at the two extremities of a lever; while the third ligature owes its power to the advantage it possesses of being made to exert a direct action at the centre of the two opposing points. This trac-

tion from within to without is precisely what the fractures of the fibula demand, in order to overcome the common disposition of the fragments to overlap each other, or, in other words, to ride.

Observations.—Although in the great majority of fractures of the leg the simple tibial board alone suffices, yet there are cases in which recourse must be had to a femoro-tibial hyponarthecia, and hence the great advantage of the sliding apparatus, fig. 12, which may be adapted to every kind of fracture of the lower extremities, and to legs of every length. The cases which form the exceptions above alluded to, are, for example, those where the fracture is very near the knee, for then it would evidently be absurd to apply the fixation-ligature in its accustomed place, namely, immediately under the patella, and therefore a longer board must be had recourse to, in order to allow of the last-mentioned ligature being applied higher up; in this case a supra-rotular ligature is required: — those where great muscular irritation or any other circumstance exacts extraordinary traction and resistance; here, the double-inclined plane is evidently indicated, and the resistance in such case will be made at the pelvis:—those, again, where the unusual contraction of the posterior muscles of the leg causes the latter to bend, not merely at the knee-joint, but even at the part corresponding to the fracture; here, also, is the double-inclined plane essentially requisite,

which, by relaxing the irritable muscles, will permit the fragments to assume a proper position.

But in the case of a common fracture of the leg there is no reason why the patient should not sit up, and in no circumstance is the value of the suspension apparatus more palpable to the commonest observer: the patient may sit up in an easy-chair, and the tibial board being suspended from a tripod or triangle similar to that seen at fig. 14, he will enjoy a multitude of advantages from which a fixed position of his limb would wholly debar him. Before closing these observations, it is necessary to remark that in cases of comminutive fracture of the leg the application of traction-ligatures must be attended with great caution; and in such cases it will be found necessary to adapt a bit of wetted pasteboard, fig. 7, to the upper part of the limb, the notched portion corresponding to the instep.

From all that has been now said of the advantages of suspension in cases of fracture, it will become more and more apparent that great relief may be derived, also, from its application in a variety of other painful, although perhaps less dangerous, affections of the extremities, see page 181; and the tripod just spoken of would be found most useful.

28. Common Rolled Bandage of the Leg.

Composition. — A single-headed roller, usually about six yards in length, and three fingers' breadth wide.

Application.—After having surrounded the toes with a couple of circulars to fix the initial end, the surgeon carries the roller round the foot, making two or three reverses there, if necessary, and effects a few double circulars about the foot and instep in the form of a figure of 8; that done, he proceeds to cover the leg, upward to the knee, in doloires, making as many reverses as the inequality of the limb requires, in order that each turn of the bandage may rest perfectly flat, and finishes the application by two or three circulars below the knee. See cut, page 24.

29. Mr. Baynton's Compressive Bandage for Atonic Ulcers of the Leg.

Composition.—Several strips of an adhesive plaster, the manner of preparing which has been already described in the first part of the volume, at page 9, about two inches in breadth, and sufficiently long to pass round the limb and leave an end of about four or five inches;—several longitudinal compresses made of soft calico;—lastly, a calico roller about three inches in breadth, and varying from four to six yards in length according to the size of the limb.

Application.—One of these strips is to be applied to the sound side of the limb, opposite the inferior part of the ulcer, so that the lower edge may be placed about an inch below the lower edge of the

sore, and the ends drawn over the lower part of the ulcer, with as much gradual extension as the patient can conveniently bear; the other strips must be applied in the same manner, each above and in contact with the other, until the whole surface of the sore and the limb is covered from one inch below to two or three inches above the affected part.

The whole of the leg should then be covered equally with the longitudinal compresses, and the roller applied round the limb from the toes to the knee with as much firmness as the patient can support. One or two circulars of the roller should be first passed round the ankle-joint, then as many round the foot as will cover and support every part of it, except the toes, and the same continued up the limb as far as the knee; the roller should be carried from the ankle upwards in doloires, as many reverses being made as the parts require, in order that each turn may lie flatly on the limb. Should the parts be much inflamed, or the suppuration very abundant, the applications are to be wetted frequently with cold spring-water. The patient may take exercise if he pleases, as this will be found to alleviate the pain and tend to accelerate the cure. The bandage ought to be daily applied soon after rising in the morning, when the parts are most free from tumefaction; and the force with which the ends of the plasters are drawn over

the limb, gradually increased as the parts return to their natural state of ease and sensibility. When the cure is thus far accomplished, the roller should be applied with as much tightness as the calico will bear, or the surgeon's strength exert, more particularly if the limb be in that enlarged or compressible state denominated the scorbutic, or the edges of the wound be wide apart.

Observations.—This bandage is liable to produce excoriations of the limb, which are never serious except when they occur over the tendo-Achillis; to prevent these, or accelerate their disappearance, Mr. Baynton recommended the application of a small shred of soft leather under the adhesive plaster: the author usually applies a bit of lead-leaf in place of the shred of leather, having found it answer better.

During the years 1830 and 1831 several of the most eminent surgeons of Paris submitted Baynton's method of compression to a series of experiments, which, as the result will show, were highly favourable to it. Velpeau found the average time of cure ten, fifteen, or twenty days, for ulcers of three, four, or five inches in circumference. Ph. Boyer, who perhaps had pushed the experiments further than any one else, found the average period of treatment, calculated upon a large number of cases, to be twenty-six days; and this result is so much the more striking as Duchâtelet was

noticing the average length of time required by the older methods, which he found in six hundred and ninety cases to be fifty-two days and a half, giving a difference of more than half in favour of Baynton's plan. In the course of these experiments some modifications were introduced; as, for instance, that by Velpeau and Ph. Boyer of the substitution of good diachylon plaster for the mixture of Baynton. So, with respect to the breadth of the plasters, the above surgeons found them more advantageous when only an inch or an inch and quarter broad. In the course of the experiments, Roux and Ph. Boyer found that the inflammatory state of the ulcer did not counter-indicate the employment of compression, which often arrested, even, its secondary effects. Marjolin, however, recommended the reducing of the inflammation before proceeding to compression. Velpeau and Roux extend the compressive treatment to contused wounds with disorganisation of the skin, which are getting into an atonic state, and also to every species of wounds with or without loss of substance when the cicatrization is slow, or otherwise checked by a general vice of the constitution, in attending, however, in the latter case to internal remedial agents calculated to benefit the system. Ph. Boyer endeavoured to cure syphilitic and scorbutic ulcers by compressive bandelettes alone, but without success; while by exerting this species of compression,

and employing, at the same time, the ordinary internal remedies, the cure was remarkably hastened.

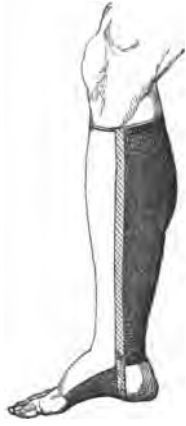
Ph. Boyer's observations all tend to support the opinion of Baynton himself, that, when the leg is properly bandaged, walking, at least moderately, tends to facilitate the cure, and renders it more complete. With regard to the periods of renewing the bandage, Velpeau found it quite sufficient to change it every three, four, or five days, according to the degree of irritation. Boyer never dresses oftener than once in forty-eight hours. Valbrune considers it necessary to renew the bandage oftener if the cessation of swelling causes it to become relaxed, but agrees with Velpeau and Boyer in thinking that the less often the bandage is disturbed the better.

30. Common Laced-Stocking for Compression of the Leg.

This bandage is formed of two pieces of shamoy leather sewed together from above downward behind the leg, and under the foot; the anterior and open borders are provided with eyelet-holes and a lace; to the inside of one of these borders should be sewed a band of the same material, for the purpose of protecting the leg against the inconvenient pressure of the lace when the stocking is applied.

31. Shoolbred and Renwick's Metallic Elastic Laced-Stocking.

It is employed, like the last bandage, for the compression of varicose veins, and also for the support of tender and extensive cicatrices of these parts, being much preferable to the ordinary rolled-bandage; it accommodates itself perfectly to the form of the leg, exerts an equal compression throughout its whole extent, and is not liable to become deranged.



32. Bandage for Rupture of the Tendo-Achillis.

Composition.—A bit of strong roller, three fingers' breadth wide, and of sufficient length to extend from four inches beyond the foot to the lower third of the thigh;—two single-headed rollers, five yards long and three fingers' breadth wide;—two graduated longitudinal compresses;—and a strong, well-padded, pasteboard splint, moulded to the fore part of the foot and leg, and reaching from the roots of the toes to a certain distance above the knee.

Application.—The foot and leg are to be held by

an assistant, the first in the most complete extension, and the second demi-flexed. Another assistant should be requested to support the thigh, laying hold of it at its middle third. The surgeon then proceeds to apply a dressing of lint or charpie to the wound, and extends the strip of roller along the sole of the foot, the back of the leg, and the lower and posterior part of the thigh. The band being maintained thus by the assistants, the surgeon equalizes the posterior part of the ankle-joint by means of some soft material, and applies the graduated compresses on each side of the tendo-Achillis. Next, taking one of the rollers, and fixing its initial end by a few circulars applied about the toes, which secures, at the same time, the lower portion of the band, he reflects the remainder of the latter backward, and covers the entire of the foot. He now passes several double circulars about the instep, in order to embrace the divided portions of the tendon, and maintain them in apposition, carries the roller to a short distance above the knee in doloires, and reflecting the upper part of the band downward, fixes it by a few horizontal circulars. In the last place, the padded splint is placed upon the fore part of the limb and confined by the second roller, carried from the roots of the toes to the middle third of the thigh, and the limb is extended over a pillow.

33. Another Bandage for the same.

Composition.—A broad band of leather or webbing, lacing round the upper part of the calf, furnished on the back part with a buckle;—two soft, graduated, longitudinal compresses;—a soft flannel roller, from four to six yards long;—and, lastly, a sock or slipper of double quilted ticking, from the heel of which a strap projects, of sufficient length to reach over the calf of the leg.

Application.—The band is laced round the upper part of the leg, the compresses applied one on each side of the tendon, and secured by the flannel roller, carried from the roots of the toes as far up as the band; the slipper being next placed upon the foot, the strap, attached to its back, is buckled to the belt, extending the foot as it is drawn tighter, and preventing any retraction of the upper portion of the tendon. When consolidation of the ruptured tendon has taken place, the patient should wear for a few weeks longer a very high-heeled shoe.

34. Metatarso-crural Cravat.

Application.—Commence by fixing a cravat about the lower part of the thigh; then, take a second cravat, and having sufficiently bent the leg, apply its centre upon the metatarsus, cross the tails upon the plantar surface of the foot, and carry up the extremities to the posterior part of the supra-rotular circlet, to which attach them securely.

Use.—Same as preceding.

35. Metatarso-pelvic Cravat.

Application.—Instead of fixing, as in the foregoing bandage, the first cravat about the lower part of the thigh, place it upon the pelvis; attach to this the extremities of the second cravat, applied in the manner just described.

Use.—Same.

36. Tibio-scapulary Cravat.

Application.—Apply the centre of a cravat to the shoulder opposed to the side affected; bring down the tails obliquely to just above the crest of the ilium of the side corresponding to the injury, so as to give it, when knotted, the appearance of the belt of a cartridge pouch. Then, flexing the leg to a right angle, apply a triangle to its anterior face—base corresponding to the knee, summit to the instep—and carrying the tails, one along the inside, and the other along the outside of the thigh, attach their extremities, securely, to the above-mentioned scapulary cravat.

Use.—Same.

Observations.—This, like the two foregoing, will be found a convenient substitute for the ordinary apparatus employed in rupture of the tendon of Achilles; with either, a patient may sit up, and even, with the aid of crutches, walk about. But the Tibio-scapulary cravat would be found, moreover, eminently useful in a variety of affections of

the leg, as the latter would be supported by it precisely as the thoracic member is by the common sling.

37. Weiss's Elastic Gaiter.

This gaiter is constructed of India-rubber, lacing along the outside of the foot and ankle; it serves admirably for sprains or weakness of the ligaments of the lower part of the leg and foot.

38. Bandage for Bleeding at the Foot.

(Syn. Etrier, Fr.)

Composition.—An ordinary ligature;—a roller two yards long and two fingers' breadth wide;—and a small compress, several times folded.

Application.—The patient should be seated, and the foot plunged for a few minutes in a basin of warm water; the surgeon then sitting before him on a low chair, or kneeling on the side corresponding to the hand which should hold the lancet, lifts the foot from the basin, and applies its plantar face upon his knee, previously covered with a towel; after having applied the ligature about three inches above the malleoli, and made the incision in the vein, he introduces the foot a second time into the warm water. When enough blood has been with-

drawn, he places the sole of the patient's foot again upon his knee, and taking off the ligature, applies the compress upon the incised part, which he confines by means of the roller, in the following manner: he places the initial end of the roller upon the side of the leg, opposite the incised part, allowing, however, four or five inches to hang down upon the malleolus externus, and fixes the compress by a couple of horizontal circulars; he then directs the head of the roller obliquely over the instep to the sole of the foot, and returns it from thence obliquely to the compress, crossing the descending turn upon the fore part of the joint; arrived at the lower part of the leg, he makes a third circular, and effects the same course as that just described, terminating the bandage by a bow, made with the two ends of the roller, upon the outside of the foot.

39. BANDAGE FOR DISLOCATIONS OF THE ANKLE-JOINT.

The Many-tailed Bandage, or Bandage of Scultetus, described page 160, may be conveniently applied in these accidents; the side-splints, however, should be furnished each with a foot-support.

40. BANDAGE FOR FRACTURE OF THE OS CALCIS.

Composition.—A uniting bandage, similar to that described page 185, for transverse wounds;—a splint and cushion, filled with oat-chaff, to extend along the front of the foot and leg;—and a single-headed roller five yards long.

Application.—The foot should be placed in the most complete extension, and the leg slightly flexed; the upper fragment of the bone should be pressed downward, and maintained in contact with the lower, by means of the uniting bandage; the cushion, and upon this the splint, should then be applied along the fore part of the leg and foot, and confined by means of the roller. After the consolidation of the fracture, the patient ought to wear a high-heeled shoe, the thickness of which should be gradually diminished as the patient recovers entire freedom of motion.

APPENDIX.

CLINICAL FRAME.*

It is, doubtless, highly gratifying to have at our service, as practitioners, a number of easy and convenient apparatus, as well as appropriate and salutary therapeutic agents; but there are circumstances in which, if we have the latter at command, the former are by no means so much in our power to avail ourselves of; whence it happens, that we are occasionally called in, under circumstances so perplexing, nay, so truly desperate, that we are content with positive inaction, rather than allow our interference to add to the patient's sufferings.

There exist, in short, a number of serious affections which not only compel the patients to keep their bed, but even place them beyond the possibility of being removed from one part of the bed to the other, without their being subjected to the most excruciating pain, or even to actual danger.

* From "Nouveau Système de Deligation Chirurgicale," a work cited in the foregoing pages.

Whether they repose upon a bed of eider-down, or are stretched upon a hard paillasse, these unfortunate individuals soon experience the want of having their bed better arranged, and of being replaced in a position more supportable. They are excoriated at all those places where the bones project, as at the sacrum and the hips; the skin, deprived of its subjacent fatty tissue, constantly and powerfully pressed against the bones, soon becomes irritated, and ultimately sloughs; whence result those deep and extensive wounds, which, incessantly exposed, to an invariable, and one might almost say corroding, pressure, to the difficulties attendant upon their dressing, and, still worse, to the continual contact of urine and fæcal matter, finish most often by compromising, of themselves, existence, and rapidly abridging its duration.

For the purpose of averting these serious inconveniences, various mechanical beds have been invented, the most ingenious of which tend to elevate entirely, and with great gentleness, the unfortunate sufferers whom it would be impossible to move with the hands or any other means, without occasioning the most heart-rending cries.

It will readily be conceived that the hands of one, two, or even three persons, are wholly insufficient to support the entire body of an adult; that the parts which are not sustained are put upon the stretch, while the others are pushed up, and that

from this unequal manner of acting the most excruciating pains ensue. And let it be, moreover, remarked that the fingers hurt by reason of their hardness; while, in addition, by all this carrying to and fro of the body of the sufferer, the most disagreeable shocks are constantly occasioned, which infinitely augment his already intolerable pain.

In point of fact, patients in general prefer supporting the whole of the serious inconveniences allied to their actually invariable and painful position, rather than expose themselves, by this lifting about, to absolute tortures; more especially when this has to be effected frequently.

Circumstances so melancholy have necessarily had the effect of awakening the solicitude of practitioners, the industry of patients themselves, and the compassion of those who are about them to contribute, if possible, to the palliation of such tortures, or at least to attenuate some of their more fatal consequences.

But it has been more particularly in favour of the minority, that is to say, of the opulent, that such efforts have been crowned with success; the peasantry, the military, and the lower orders of society in general, still remain without the pale of benefit arising from the invention of machines calculated to avail in circumstances such as those just pointed out. The reason of this is evident; the means indicated, and known under the title of Me-

chanical Beds, are so complicated and so costly, that they can only be within reach of persons in easy circumstances. In hospitals, even, these beds are generally few in number, and their use is very limited.

So great, therefore, is the difficulty of obtaining these apparatus, and still more the difficulty of adapting them to the exigencies of the most numerous classes of the community—classes which, be it observed, are the most constantly exposed to affections demanding contrivances of this kind—that it has been of the most urgent consequence to consider of other means than such pieces of mechanism, and to seek for what seems to have been, hitherto, wholly lost sight of, namely, a contrivance within the reach of every individual, and applicable in every circumstance. This desideratum will be found in the CLINICAL FRAME about to be described.

The first things to be sought for are two narrow boards or poles of about the length of the patient, and two cross-bars of the same nature, of about a yard only in length. With these four pieces of wood, which may be easily united at their extremities by means of nails, rivets, bits of cord or handkerchiefs, we shall be immediately in possession of a frame in all respects stout enough for the end in view. It now remains to fill up the intermediary space; recourse must here be had to

bands of webbing; but if these should not be at hand, or at all events should they be difficult to obtain, a few stout cravats would conveniently supply their place. Whether, then, the webbing bands or the cravats be employed, they must be arranged crosswise, fastened securely at their extremities to the sides of the frame, and, above all things, possess sufficient strength to resist the weight of the patient when suspended in the air. Substitutes for the above materials may be equally found in towels, napkins, sheets, or indeed in any thing that would serve to constitute a bottom, soft, but yet sufficiently strong. After such simple data, it would be superfluous to point out how ingenious mechanics might modify the contrivance so as to prepare a frame more elegant, more in harmony with their own talent, their desire of gaining reputation, or indeed with the fortune of those who employ them; on the contrary, it would be advisable to urge the necessity of preserving the same simplicity in the construction of this, which will be found in the means destined to effect its elevation; for there will be quite enough of those who are ever on the alert to throw a species of luxury about a machine, who will believe that they have perfected this, when, from a simple and effective instrument, they will have converted it into a complicated one despoiled of its best qualities.

To raise the frame, as well as the patient, who is supposed to be stretched upon its bottom, it would be sometimes sufficient to employ two or three dexterous persons such as are met with in hospitals; but in addition to the difficulty of finding such assistants, there will be always more or less inconvenience attending this operation when effected by the hands, in consequence of the shocks to which the frame will be constantly subjected from the slightest deviation from a simultaneousness of action. It will therefore be found more convenient to have recourse to the means employed in the hyponarthecic suspension, and to apply to the whole body that which so well succeeds when applied to a limb.

Thus the four angles will be perforated with four holes, see fig. 1, through which a strong cord will be run in order to form two kinds of parallel bows or arc-loops of suspension; the one longitudinal, the other transversal; the former corresponding to the sides, the latter to the extremities of the frame.

Recourse may be had also to one loop only, which will give to the frame the kind of tilting (jeu de bascule) observed in the beam of a scale. Movements of this kind are occasionally of importance, as when it is desired to raise the upper part of the body much above the horizon, or even the lower part alone.

One strong vertical cord, firmly attached, and passing through a pulley, will suffice for the elevation of the frame charged with the patient, and must be arranged in the same manner as for the hyponarthecia of the extremities. Thus, in the dwellings of the poor, particularly of the peasantry, the ceiling is usually provided with large beams; nothing, therefore, will be found more easy than to arrange properly the staples or pulleys. Recourse may be equally had to a suspension bar of the kind represented in fig. 14, at the head of the bed. But when these resources fail, or cannot be employed without some disadvantage, let it be remembered what is done by certain mechanics, particularly masons, when they desire to lift a heavy weight. The *tripod*, called generally the triangle, is the most easily constructed, the most firm, and in all respects the most convenient that can be employed for the object here proposed. This tripod, seen in fig. 14, should have a pulley attached to the iron hook observed at its upper part, or point of union, in order to receive the vertical cord destined to raise the frame, and, thus provided, should be stretched across the bed.

In order to render the ascent of the frame perfectly gradual and easy, the vertical cord should be made to pass round a cylinder, fixed to two of the legs at their upper part, which may be turned

either by a winch, or, if provided with holes and a small handle, as a capstan.

Instead of this, if the free end of the vertical cord, after having passed through the pulley, be firmly secured to one of the legs of the tripod, the above effect may be accomplished by means of a strong stick, which is employed to twist the cord, and which, by shortening it at each turn, elevates the frame.

But a still easier method is to employ a simple lever of the first power,—a pole, for instance,—whose fulcrum should be beside the bed, and to one end of which should be fastened the arc-loops themselves, as seen in fig. 14, or, what is still better, the vertical loop, which will permit, during its elevation, the frame to be better balanced: in lowering, therefore, the other end of the lever, the ascent of the frame may be regulated with precision. The fulcrum, thus placed between the power and resistance, may be simply a rope's end made into a loop, and either firmly attached to the ceiling, or else to the tripod, which, in this case, instead of being stretched over the bed, should be placed beside it.

With the ordinary hyponarthecic loops attached to the Clinical Frame, which will allow of the point being varied where they are taken up by the vertical loop, we obtain, with the greatest facility, the power of elevating this frame in any direction we

may choose, whether completely horizontally, or with an inclination towards either of its extremities or either of its borders; an advantage which will not be without its utility on particular occasions.

It will be hardly necessary to observe that, in order to obtain these effects, it suffices merely to place the vertical cord at the centre of gravity itself of the frame, or more or less beyond this, in the direction either of the head or feet, and to make, for producing lateral inclination, the arc-loop shorter on one side than on the other. The arc-loops, however, ought to be collateral, for all these little advantages would be far less easily obtained were the cords, which perform the office of loops, placed transversely at either of the extremities of the frame.

Like all frames destined for a clinical use, that just described may rest continually in place, in order that it may be raised at the moment desired, without previous preparation; that is to say, the patient should repose upon the bottom itself of the frame; or else this elevation may be applied at the instant only occasion may require it. In the first case, we should be careful that the bands or the pieces of cloth which constitute the bottom of the frame do not annoy the sufferer, and are preserved as clean as possible. The thing will not be difficult if preference be given to large pieces of stout cloth, which will occasion so much the less incon-

venience, as they may be stretched at will, without forming any incommodious folds.

It will be clearly seen, moreover, that, with this disposition, the object of the surgeon should be to expose the ulcerations, and manage the application of dressings, by displacing from the bottom of the frame that portion which otherwise masks the affected parts.

When, on the other hand, it would be found advisable to apply and elevate each time the frame, recourse should be had to the webbing bands, which, by means of a broad, thin, pliant piece of wood, may be glided, at the very moment, under the patient, much in the same manner as we should change the bandelettes in the apparatus of Scultetus. These bands, already attached to one side of the frame by one of their extremities, are then brought to the opposite side, where they are fastened, by means of their free extremities, through the intermedium of ribands, buttons, or buckles. This simple and easy means of gliding the bands under the patient, without at all incommoding him, and thus interposing between the bed-clothes and himself some sort of bottom proper to sustain him when elevated, would naturally suggest a still more simple support, namely, cravats or oblongs, of whatever tissue they may be composed, or of whatever breadth it may be thought proper to afford them. The Clinical Frame may not only be regarded as a

species of hyponarthecia, destined to sustain momentarily the entire body in any manner, or in any direction desired to be imparted, but, being mobilized, it will be seen to offer one very precious resource in a circumstance of the most important nature. Allusion is here made to the decubitus, or frightful sloughing sores common to the lower and back part of the body, and which the pressure against the bandelettes renders insupportable, and tends constantly to exasperate. Many are the means, without doubt, employed to attenuate this horrible pressure; yet they not only most often fail, but are difficult to procure, to maintain in place, and preserve in a proper state of cleanliness. The Clinical Frame, then, with very little additional trouble, averts this inconvenience in the following manner.

Let the individual be extended over the bands placed transversely behind the back, and let us suppose that these bands are properly stretched from one side of the frame to the other; it is clear that the poor sufferer will press upon them all with his entire weight. But if we detach those bands which correspond to the ulcerations, and if, at the same time, we remove sufficient of the hair, wool, or straw of the mattress which exists under the bands we have just placed aside, we shall immediately obtain a sort of hollow or depression, in which the ulcerated surface will be but very slightly touched. It will be even possible to afford such

depth and extent to this depression that the affected parts remain, as it were, in the air, in a complete state of isolation. In short, the bands, placed above and below the seat of ulceration, will sustain the body with great exactness, and will leave the decubitus at liberty, and at that degree of elevation which may be judged necessary to subtract it, more or less, from the pernicious influence of the pressure we are striving to avoid.

It may be, however, observed, that, instead of the excavation already spoken of, the mattress may be cut across, and of one mattress two smaller formed, which may be placed so as to allow of a sufficient space between them to guarantee the wound from pressure, according to its extent.

The Clinical Frame may, in campaign, admirably serve for a litter, for the transport of the sick or wounded; it possesses the advantage of the most simple form of construction, and of being made of materials to be found on all occasions. In this case, instead of webbing or other bands, to form the bottom of the frame, recourse may be had to simple cords covered with hay, straw, leaves, grass, pieces of clothing, &c. When it is found necessary to have the litter stationary, nothing would be more easy than to adapt to it a tripod or triangle, which would possess two remarkable advantages; firstly, in forming solid feet for the support of such temporary bed; and, secondly, in forming a

frame proper to receive a blanket, or something of the kind, to serve the purpose of a curtain, and to protect the sufferer from the sun, rain, wind, &c.

Many other occasions might, doubtless, be found for the utilization of this frame when put into suspension. Serving as a sort of hammock, it would seem to invite officers to establish it under their tents, and would guarantee them from the humidity of the ground, from insects, and other annoyances inseparable from a bed placed directly upon the earth. The same may be said of it in a bivouac, where the triangle need only be covered by a cloak.

The suspension-bar, as seen in fig. 14, adapted to a common hospital bed, has been already pointed out in the body of the work as a means of establishing the suspension of a hyponarthecic apparatus: it requires no description, for the drawing will suffice to give the most correct idea of its construction. It will be seen therein to represent, however, only one half of it, as the drawing of the other half would have interfered with the view of the tripod.

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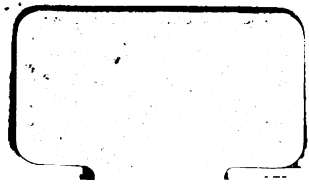
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